The Garden Journal

of The New York Botanical Garden

Vol. 3, No. 5 Sept.-Oct., 1953

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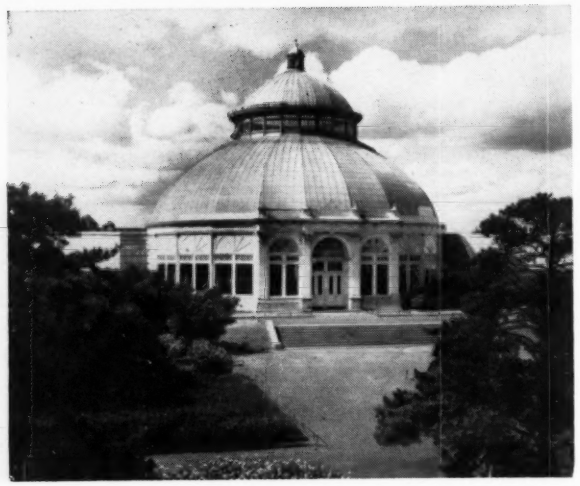

Ninth Annual Chrysanthemum Show, in cooperation with the Western Long Island, Westchester, and Northern New Jersey Chapters of the National Chrysanthemum Society, to be held in the Conservatory, October 23, 24, 25.

Annual Flower Arrangement Competition for school children of New York City, sponsored by the Volunteer Associates of The New York Botanical Garden, in cooperation with the School Garden Association of the Board of Education of the City of New York, in the Museum Building, October 24.

"Autumn Glory — A Pageant of Chrysanthemums," flower show in the Conservatory, featuring chrysanthemums in many types and varieties and illustrating different methods of training, November 6-22 inclusive.

Exhibition, "Cotton From Fable to Fashion," continues in the Museum Building until November 15.

DOROTHY EBEL HANSELL
Editor

THE GARDEN JOURNAL
of The New York Botanical Garden

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AMONG OUR CONTRIBUTORS

DR. H. W. RICKETT is Bibliographer of The New York Botanical Garden, author of THE GREEN EARTH and co-author with Dr. William J. Robbins, Director of The New York Botanical Garden, of BOTANY. Dr. Rickett has edited WILD FLOWERS OF AMERICA, to be published in October by Crown Publishers. This handsome book will contain four hundred full-color, actual-size flower reproductions by Mary Walcott and Dorothy Platt. . . . DR. DONALD P. ROGERS is Curator of The New York Botanical Garden. He was appointed to serve as Vice-Chairman of the Section on Fungi of the International Congress for Microbiology, being held in Rome this month, and prepared a paper on *Neurospora* to be read there. Dr. Rogers has also been designated as one of the vice-presidents of the Section Mycology of the International Botanical Congress to be held in Paris next year. . . . DR. CHARLES H. CONNORS has been a prominent personage in horticultural circles for many years, in demand as lecturer and writer. He has been identified with Rutgers University since 1909, first as student, then as instructor. In 1931 he became Professor, in 1946 Research Specialist in Ornamental Horticulture. Dr. Connors has specialized in plant breeding and nutrition of fruit and greenhouse crops. Dahlias have long been one of his hobbies, so too have hollies. . . . SALLY R. (MRS. R. THEODORE) BULLINGTON is an active member of the National Chrysanthemum Society, sharing her husband's enthusiasm for the "queen of autumn." . . . From one of the oddest — and one of the most important — buildings at the College of Agriculture, Rutgers University, has come significant information about weather in the so far little studied micro-climate. In the six-foot square, gray frame structure DR. ERWIN REINHOLD BIEL, Chairman of the Department of Meteorology, has conducted studies that have an important bearing on agricultural climatology. His classes have grown from six students in 1938 to more than one hundred fifty at the present time. This Vienna-born scientist, in addition to the teaching and research work he does at Rutgers, teaches each summer at the University of Chicago's Institute of Meteorology, is writing two books, and still finds time to haunt museums and art galleries. . . . JOSEPH MONACHINO is Associate Custodian of the Herbarium of The New York Botanical Garden. . . . HELEN M. (MRS. MORTIMER J.) FOX, member of the Advisory Council of The New York Botanical Garden, lecturer and author, visited Greece as well as Israel this spring. . . . WILLIAM G. MITCHELL is located right in the heart of the citrus industry, is Assistant Editor of the Agricultural Experiment Station of the University of Florida at Gainesville. . . . SARAH R. RIEDMAN and her publishers, Thomas Nelson & Sons, very kindly granted permission to reprint part of chapter five from her book, GRASS: OUR GREATEST CROP, 1952. Dr. Riedman, Assistant Professor of Biology at Brooklyn College, is author of a number of books on scientific subjects for young people. She and her husband own and direct a summer farm-camp in northern New York, where city children learn the basic sources for food supplies and the problems of farming. . . . GERTRUDE B. FOSTER is editor of "Herb Grower Magazine."

CREDIT FOR ILLUSTRATIONS

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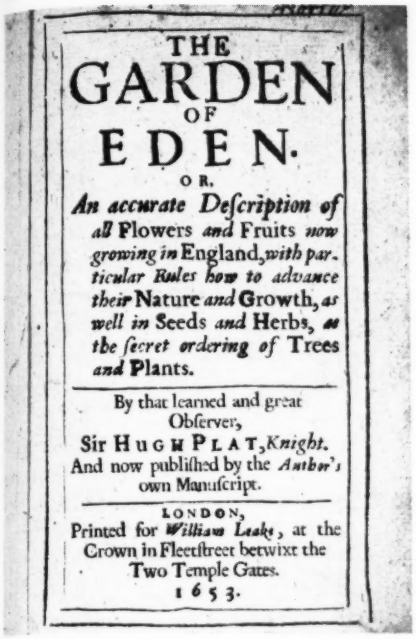
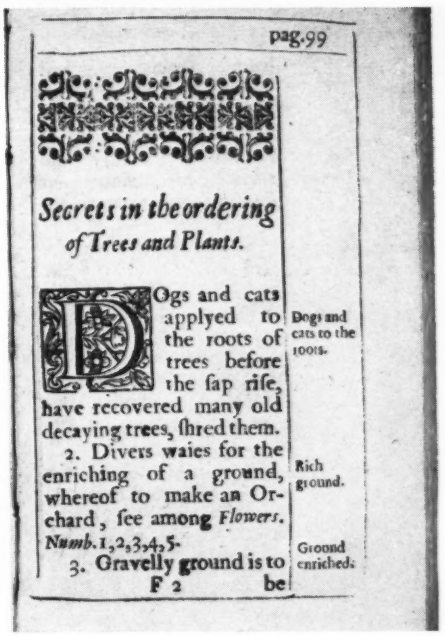
The Garden Journal of The New York Botanical Garden is published bimonthly by The New York Botanical Garden, Bronx Park, New York 58, N. Y. Printed in U. S. A. Re-entered as Second Class Matter, February 1, 1951, at the Post Office at New York, N. Y., under the Act of August 24, 1912. Annual subscription, $2.00. Single copies 35 cents. Foreign countries and anywhere outside the continental United States, 50 cents a year extra.



THE
GARDEN
OF
EDEN.
OR,
An accurate Deſcription of all Flowers *and* Fruits *now growing in* England, *with particular Rules how to advance their* Nature *and* Growth, *as well in* Seeds *and* Herbs, *as the ſecret ordering of* Trees *and* Plants.

By that learned and great Obſerver,
Sir HUGH PLAT, *Knight.*
And now publiſhed by the *Author's* own Manuſcript.

LONDON,
Printed for *William Leake*, at the Crown in Fleetſtreet betwixt the Two Temple Gates.
1653.



pag. 99

Secrets in the ordering of Trees and Plants.

Dogs and cats to the roots.

Dogs and cats applyed to the roots of trees before the ſap riſe, have recovered many old decaying trees, ſhred them.

Rich ground.

2. Divers waies for the enriching of a ground, whereof to make an Orchard, ſee among *Flowers. Numb.* 1,2,3,4,5.

Ground enriched.

3. Gravelly ground is to

F 2 be

Title page and page 99 of *The Garden of Eden* by Sir Hugh Plat, the oldest book in the Clarence Lewis collection

Notes from CLARENCE LEWIS' LIBRARY

Old Garden Books and Their Authors

Part I

By H. W. Rickett

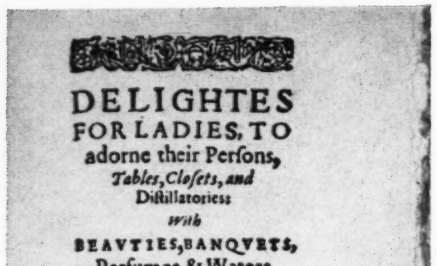
A FEW weeks ago I spent two days in Clarence Lewis' library at his home in the lovely Ramapo Hills. I was helping to select and to pack into automobiles some two thousand volumes on botany and horticulture given by Mr. Lewis to The New York Botanical Garden. From time to time as I pulled out the manuals for the determination of plants, the books on growing everything from *Allium* to *Zinnia,* the stories of the introduction of lilies from China and of primroses from Thibet, the works on insect pests, on rock gardens, on landscape architecture, on gardens of America, of Italy, of China — from time to time my eye would be caught by a volume smaller than average, bound in old calf, dingy with age, and titled in hand-stamped characters on a label of red or green leather. Some of these duodecimos were printed in the eighteenth century; two in the seventeenth. They will serve no longer for "Gentlemen, who have small Gardens," to "make themselves Masters of the Art, and manage them with little Expence, to their Satisfaction," or to inform us of "everything that is proper in the Kitchen-Garden, Flower-Garden, and Green-House, not only as to English, but Out-landish Fruits, Herbs, Plants, Flowers, curious Per-annual-Greens, and others. . . ." Yet they will still remind us that gardening is an ancient art and gardeners then and now not altogether different. Moreover, a glimpse at the gardeners and gardens of another age may cast a more revealing light on the life of those times than a chronicle of their kings, wars, and politics. In support of which assertions, the following notes are submitted on the small bibliographic curiosities mentioned above, with other appropriate matters.

The oldest book which I found in the Lewis collection is entitled *The Garden of Eden. Or, An accurate Description of all Flowers and Fruits now growing in England, with particular Rules how to advance their Nature and Growth, as well in Seeds and Herbs, as the secret ordering of Trees and Plants.* It was printed in London in 1653 "for William Leake, at the Crown in Fleetstreet betwixt the Two Temple Gates." It contains 175 pages, measuring 13.5 × 8.5 cm., bound in old black calf, perhaps as old as the imprint.

The author was Sir Hugh Plat (or Platt), who was born in 1552 and died probably in 1608; he was contemporaneous with the first Elizabeth. In that lusty and forthright age — so different from our own — he was well known for his writings on gardening, on agriculture (he was considered an authority on soils and manures), on the extraction of flavors and perfumes, and on other matters. He came of a well-known Hertfordshire family, studied at St. John's College in Cambridge, was knighted by James I for his mechanical inventions. He was claimed as a friend by Gerard, and himself maintained at least three famous gardens. It is said also that he invented alphabetical blocks for children. A versatile and vigorous man, filled with the love of life, both animal and vegetable.

The *Garden of Eden* is the second edition of *Floraes Paradise, beautified and adorned with sundry sorts of delicate fruites and flowers,* printed in London in 1608. Of this I have seen no copy; it is not in the Library of Congress catalogue. Sir Hugh had been forty-five years in his grave when the second edition appeared; Charles Bellingham, his kinsman, brought it out and furnished a dedication: "the memory of that learned Knight the Authour (to whom I had so neer Alliance) may excuse this presumption. He was a great Searcher after all sorts of Knowledge. . . ." In his preface, Bellingham wrote further: ". . . what ever you may think of this small Piece, it cost the Author many yeares search, and no small expence, there being not extant (in our language) any work of this Subject so necessary and so briefe." Actually Thomas Tusser, Thomas Hyll, and others had long since published their works; perhaps these were not so "necessary"; and, of course, they may have been no longer available.

Sir Hugh himself in "The Author's Epistle to all Gentlemen, Ladies, and

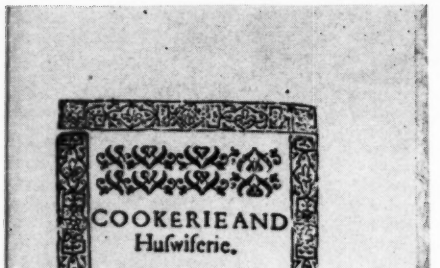


DELIGHTES
FOR LADIES, TO
adorne their Perſons,
Tables, Cloſets, and
Diſtillatories
with
BEAVTIES, BANQVETS,
Perfumes & Waters.

Reade, Practice, & Cenſure.

AT LONDON,
Printed by HVMFREY
LOWNES.
1609.

XV



COOKERIE AND
Huſwiſerie.

To ſouſe a young Pig.

TAke a yong Pigge being ſcalded, boile it in fayre water and white wine, put thereto ſome Bay leaues, ſome whole Ginger, and ſome Nutmegs quartered, a few whole cloues, boile it throughly, and leaue it in the ſame broath in an earthen pot.

Aliter.

TAke a Pigge being ſcalded, collar him vppe like brawne, and lay your collars in fayre cloathes: when the fleſh is boyled tender, take

Title page and page 63 of *Delightes for Ladies*, one of the best known of Sir Hugh Plat's many writings

all others delighting in God's Vegetable Creatures," writes about "Schoolmen, who have already written many large and methodicall volumes of this subject (whose labours have greatly furnished our Studies and Libraries, but little or nothing altered or graced our Gardens and Orchards)...." The other day when I was myself excavating a new flower-border from the glacial till of Westchester County, I thought long and rather bitterly of those who explain, in their writings, how to dig and double-dig but are obviously unacquainted with the handles of pick and shovel. Sir Hugh writes further of his "two hundred experiments" of which there may "happen a few to faile under the workmans hand. . . ." In short, here is an early advocate of the experimental method on which we moderns pride ourselves so much, and use now and then.

The text, however, scarcely lives up to the title. There are first 14 pages of "Alphabeticall Table" serving as an index to the topics to be treated, for instance: "Apricot multiplied, 127. Apricot, which is best, 136. Apricots fair, 157. Apricots to bear well, 148. Apricot stones to set, 155. Arbour when to cut, 90. Arbour aloft, 94." These matters are taken up in 88 numbered paragraphs entitled "A briefe Description of all sorts of *Fruits & Flowers*, with means how to advance their nature and growth in England," and 136 further paragraphs under the heading "Secrets in the ordering of Trees and Plants." The different subjects are not organized into any sequence, but are apparently set down (much as in Bacon's *Sylva sylvarum*) just as they came to the author's mind. There is actually no description of fruits and flowers, but miscellaneous notes on culture. It may well be that these were based largely on his own experience and were both new and practical. Some of his methods were obtained from other gardeners, and are duly credited: "By Mr. Hill," "Tomkins the Gardener," "Master Iacob of the Glasse-house," and "this of Mr. Nicholson, Gardiner."

Some of his statements he did not put to the test of experiment. "By sitting upon a hill late in an evening, neere a wood, in a few nights a firedrake will appeare; marke where it lighteth, and there you shall finde an Oake with Mistletoe therein, at the root whereof there is a missell-child, whereof many strange things are conceived. *Beati qui non crediderunt.*" But there is surprisingly little of this sort of thing. "Cut your Roses, after they have done bearing, so soon as the Moon will give you leave, *viz.* the fourth, fift, or sixt day after the change, and so you will have stores of Roses againe about Michaelmas, or after. Take heed you cut no branch of a Rose so low, as that you leave no leading branches upon it: for that will hinder the bearing of the Roses exceedingly." Perhaps a certain amount of magic must always be included in advice to growers. Of the "Secrets" the first is perhaps the most startling: "Dogs and cats applyed to the roots of trees before the sap rise, have recovered many old decaying trees." Hopefully the animals were dead when "applyed." But most of these paragraphs have to do with grafting. Many are queries propounded for future research, as: "100. *Quaere,* what hearbs, flowers, or branches of trees, may be grafted upon the bay or holly tree, or any such tree as keepeth green to winter, to make them also carry green leave in Winter."

The book closes with "A Philosophicall Garden: with a touch at the vegetable work in Physick, whose principall fire is the Stomach of the Ostrich." This contains instructions for making a sort of pit of compost, for the raising of exotic plants; then the following philosophic speculation: "Nay, if the earth itselfe, after it hath thus conceived from the cloudes, were then left to bring forth her own fruits and flowers in her own time, and no seeds or plants placed therein by the hand of Man, it is held very probable . . . that this heavenly earth, so manured with the stars, would bring forth such strange and glorious plants, fruits and flowers, as none of all the Herbarists that ever wrote til this day, nor any other, unlesse *Adam* himselfe were alive again, could either know, or give true and proper names unto these most admirable simples." And finally "Now to give you some tast of that fire which the Philosophers call the *Stomach of the Ostrich* (without which the Philosophers true and perfect *aqua vitae* can never be made) you must understand, that it is an outward fire of Nature, which doth not onely keep your Glasse, and the matter therein contained, in a true proportionable heat, fit for workmanship, without the help of any ordinary or materiall fire: but it is also an efficient and principall cause, by his powerfull nature and pearcing quality, to stir up, alter and exalt, that inward fire that is inclosed

within the Glasse in his own proper earth." I suppose that to write a book, in those days, without mentioning some such magical ingredient would subject the writer to the same sort of ridicule and scepticism as we should now visit on anyone who advised the inclusion of the stomach of an ostrich in the compost (though, for that matter, astrology is still respectable in many quarters). Sir Hugh at least has his tongue in his cheek.

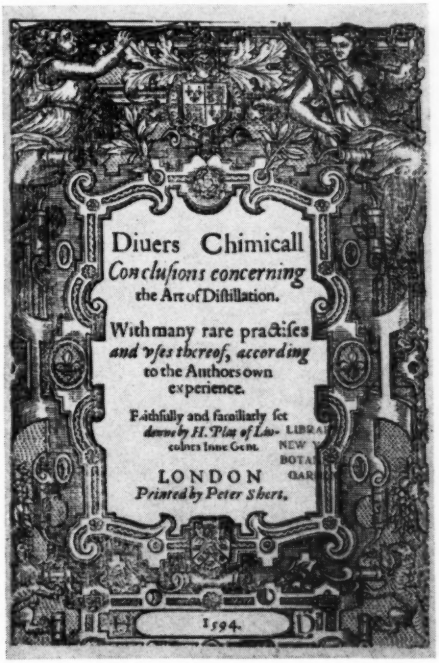
On the back of the last page is a list of the "books printed or sold by *William Leake* at the signe of the Crown in Fleetstreet between the two Temple Gates" — certainly one of the earliest of publishers' advertisements. It begins with "A Bible of a faire large Roman letter" and "Yorke's Heraldry" and closes with "Mathematicall Recreations with the Generall Horologicall Ring, and double Horizontall Dyall, by *William Oughtred.*"

According to Rohde *(The old English gardening books,* p. 121), subsequent editions appeared in 1654, 1659, 1660. Pritzel *(Thesaurus literaturae botanicae,* ed. 2, no. 7180) lists the fifth edition of 1660, still with 175 pages; also "the second part" with the same date, containing 159 pages. The latter is also in the British Museum (Natural History). The copy mentioned by Hazlitt *(Gleanings in old garden literature,* p. 206) is "in two parts, 12 mo., 1653-1660." According to Fussell *(The old English farming books,* p. 15) the sixth edition is dated 1675, and has "a second part taken from Plat's unpublished notes." This edition and that of 1653 are in the Library of Congress.

Of all Sir Hugh Plat's many and varied writings, perhaps the best known and most loved is his *Delightes for Ladies, to adorne their Persons, Tables, Closets, and Distillatories: with Beauties, Banquets, Perfumes & Waters. Reade, Practice, & Censure.* This was published anonymously; but many of the paragraphs are verbatim reprints of paragraphs in an earlier work by Sir Hugh, *The Jewel House of Art and Nature containing sundry experiments in the art of husbandry,* printed by Peter Short in London in 1594. At least they are identical with those of a later edition of this work, which I have seen in the New York Public Library, dated 1653. The *Delightes for Ladies,* which first appeared separately in 1602, went through thirteen editions by 1654. We have in the library only a reprint by the Trovillion Private Press, made in 1939 from the edition of 1609, with illustrations from the 1602 edition, and an introduction by Rosetta E. Clarkson. Copies of the editions of 1609 and 1656 are in the New York Public Library, and the Library of Congress has that of 1632.

This work Rohde characterizes as the "tiniest and surely the most charming of all still-room books" (it measures 12 × 6.5 cm.). A still-room was originally a room containing a still, with which to extract and distill perfumes, syrups, cordials, and the like. It came to be used also for the preserving of fruits, the candying of flowers, the storage of cakes, and, in later years, for the preparation of tea and coffee. Sir Hugh ranges over many of these subjects, of which he must have himself made trial: "The arte of preserving"; "Secrets in distillation"; "Cookerie and Huswiferie"; "Sweete powders, oyntments, beauties, &c." Some of the recipes are enough to make any gourmet lick his lips: try that for making "a most excellent sirup of Violets, both in taste and tincture"; or "a most delicate and stiff sugar paste, whereof to cast Rabbets, Pigeons, or any other little bird or beast, eyther from the life or carved moulds." There are recipes for Marchpane (marzipan), Prince-bisket, Ginger-bread, Quidinia of quinces, Gelly of Straw-berries. . . . A spicy fragrance seems to pervade the very pages. In the hubbub of installing gas stoves, electric refrigerators, and dishwashing machines, we may have lost something. In "Cookerie" he tells us how "to souse a young pig" and "to boile Pigeons with Rice," of "the true bottling of beer," and many other things. Under "Sweete powders, oyntments" are found a way to "take away spots and freckles from the face or hands" and another "to take Chilblanes out of the hands or feet." We read also of "a delicate Stove [for Gentlewomen] to sweat in" and "sweet bags to lye among linnen." Under the heading "Sweet and delicate dentifrices or rubbers for the teeth," which sounds modern enough, he has this to say: "here, by those miserable experiences, that I have seene in some of my neerest friends, I am forced to admonish all Gentlewomen to be careful how they suffer their teeth to be clensed and made white with any *Aqua fortis,* which is the Barbers usuall water; for unlesse the same bee both well allayed, and carefully applied, shee may happen within a few dressings to bee forced to borrow a ranke of teeth to eate her dinner, unlesse her gummes do help her the better."

(Continued on page 148)


Diuers Chimicall
Conclusions concerning
the Art of Distillation.
With many rare practises
and vses thereof, according
to the Authors own
experience.
Faithfully and facultatively set
downe by H. Plat of Lon-
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LONDON
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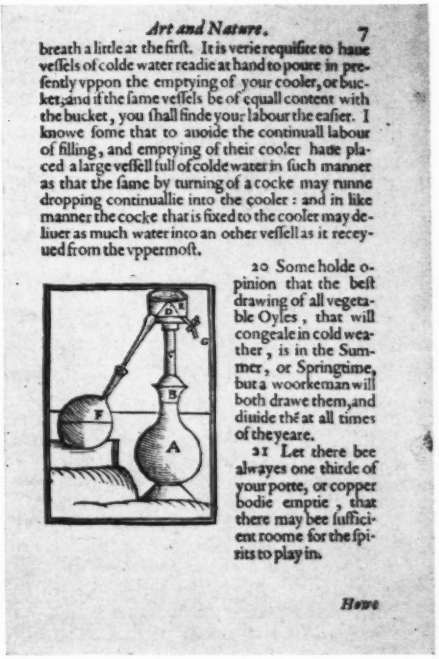
Art and Nature. 7
breath a little at the first. It is verie requisite to haue vessels of colde water readie at hand to poure in presently vppon the emptying of your cooler, or bucket; and if the same vessels be of equall content with the bucket, you shall finde your labour the easier. I knowe some that to auoide the continuall labour of filling, and emptying of their cooler haue placed a large vessell full of colde water in such manner as that the same by turning of a cocke may runne dropping continuallie into the cooler: and in like manner the cocke that is fixed to the cooler may deliuer as much water into an other vessell as it receyued from the vppermost.

20 Some holde opinion that the best drawing of all vegetable Oyles, that will congeale in cold weather, is in the Summer, or Springtime, but a woorkeman will both drawe them, and diuide thē at all times of the yeare.

21 Let there bee alwayes one thirde of your porte, or copper bodie emptie, that there may bee sufficient roome for the spirits to play in.

Howe

Title page and page 7 of facsimile reprint of Divers Chimicall Conclusions, London, 1594

Dr. Dodge's NEUROSPORA

By **Donald P. Rogers**

In the early 1840's a pink mold appeared in France on bread. Whether it had been noticed much before is not known; since there are no recognizable accounts of the fungus earlier than 1843, the probability is that no conspicuous or wide-spread damage had resulted from its activities up to that time. In 1841 a French pharmacist brought the mold to the attention of a student of the fungi, who published a description, a name, and some detailed microscopic drawings. That year or the next the mold caused such extensive spoilage in army bakeries, that the French minister of war appointed a commission to examine the matter, and a second able mycologist published, in its report, a second description and name. Thereafter it was frequently noted and studied as a pest, not only in western Europe, but as far away as Brazil and Japan, and in the United States. It now seems likely that the mold and its relatives were originally inhabitants of the warmer parts of the earth, and that this one species found food and favorable conditions for growth in bakeries.

The pink mold was long known as *Monilia sitophila* — "monilia" from a word for necklace, because it bears spores in series like strings of beads, and "sitophila," meaning bread-loving — and thereby assigned with all other monilias to that great miscellany, the *Fungi imperfecti*. These imperfects are so called because important stages of their life cycle are wanting or unknown. They generally reproduce themselves only by conidia, spores that are essentially nothing but more or less uniform or specialized fragments of the mycelium (aggregate of threads) that makes up the fungus body. The imperfects are like flowering plants that never flower, but reproduce only by such vegetative parts as are able to strike root. They may be important for the destructiveness or usefulness of their activities; but for themselves, as organisms capable of furnishing light on the nature and relationships of living things, they are generally ignored. All that, so far as it applies to the pink molds, was changed by the work of Dr. B. O. Dodge.

In the first quarter of the present century, perfect fungi associated with red or pink molds were collected in Brazil, Japan, Surinam, and on the refuse of sugar mills in Louisiana. All of these, and other strains lacking the perfect stage, were gathered together by Dr. Dodge and Dr. C. L. Shear, both then of the United States Department of Agriculture, and assigned to a new genus *Neurospora* and to four distinct species. All of the neurosporas have a loose, mold-like mycelium, which bears bright pink, bead-like conidia in branching chains. The perfect stage of the same fungi consists of minute black fruiting-bodies, oval or pear-shaped, and one to two hundredths of an inch in diameter, formed on the same mycelium that produces the conidia. These are perithecia; each is hollow, and has a narrow canal extending from the central cavity through the tapered upper portion to the outside; and each produces within its cavity a cluster of clear, colorless, club-shaped sacs, the asci, in which spores are borne. The spores are long-oval like a goose egg, black, and marked on the outer surface by close-packed raised lines—whence comes the name of the genus: nerved, or lined, spores. In nature these ascospores are discharged through the canal of the perithecium and on germination give rise to a new mycelium and a new crop of pink conidia.

The importance of ascospores in the life cycle of the fungus, and in its classification, results from the fact that before their formation two nuclei must have fused within the ascus, and the resulting single nucleus must have divided to restore the chromosome number found in the mycelium and in the nuclei that fused. The ascus at one stage, therefore, corresponds to the fertilized egg of an animal or higher plant; the ascospores correspond to the spores of a higher plant and in nuclear condition to the gametes of an animal. Because the ascus is necessary to determine the relationships of the fungus, and because it is the site of processes corresponding to the critical phase of fertilization in these other organisms, it is the criterion of the perfect stage in the life cycle. *Monilia* is one of the *Fungi imperfecti; Neurospora* is a member of the *Ascomycetes*.

Of the four original species of *Neurospora* two, *N. erythraea* from Brazil and *N. tetrasperma* from Surinam, bear four spores to the ascus, and the other two, *N. crassa* from Louisiana and *N. sitophila*, the perfect stage of the ubiquitous pink bread-mold, bear eight. The Brazilian species has never been available for study in living condition, and the details of its life cycle are unknown; the others were studied in pure culture.

A single ascospore of *N. tetrasperma* promptly gives rise not only to mycelium and conidia, but to perithecia and a new generation of ascospores. A single ascospore of *N. sitophila* or *N. crassa*, on the other hand, fruits only by conidia; in order to produce the perfect stage it is necessary to grow two mycelia, derived from two ascospores, together. This observation accounts, of course, for the comparative rarity of perithecia in nature. And it is not sufficient that any two ascospores be paired; the spores (and mycelia and conidia) of either species are separable into two groups, such that a member of one group will mate with any member of the other, and for perithecia to be formed a member of each group must be present. This would suggest a differentiation into males and females; but except for the separation into mating-groups there are no constant differences; *N. sitophila* and *N. crassa* are therefore not sexually differentiated but are what is called

heterothallic. Even *N. tetrasperma* has a latent heterothallism. Although a single normal ascospore or conidium can give rise to a mycelium that produces perithecia, an occasional ascus contains, instead of four large spores, three large and two small ones; the mycelia from the latter develop perithecia only when paired with a complementary strain from another ascospore.

From this beginning Dr. Dodge continued his study of the genus with a paper published in the same year (1927) dealing with the nuclear phenomena — that is, the mechanism by which hereditary factors are redistributed — in the ascus of *N. tetrasperma*. The fusion nucleus soon divides to form two, the two to form four, and the four to form eight. From the second division the daughter nuclei move apart to opposite ends of the ascus, and from the third, to opposite sides. The result of this pattern of division, which deserves to be called a manoeuvre, is that the final eight nuclei come to be arranged in four pairs within the ascus. Normally each pair is then surrounded by a wall, and so comes to lie within one of the four large spores that characterize this species. Occasionally the two nuclei of one pair are enveloped in two separate membranes and form the centers of the rarer small spores.

As had already been reported, these small spores give rise to heterothallic mycelia. The explanation is clear from the study of the nuclear behavior in the ascus: a small spore contains only one nucleus, and only one of the two mating-types. The reason a single large spore can give rise to fertile mycelium is equally clear: it contains two nuclei. And finally, the importance of the special pattern of nuclear division, whereby non-sister nuclei move together to the ends of the ascus at the beginning of the four-nucleate stage, and to the sides at the eight-nucleate stage, then becomes clear: if, as appears normal, the factors for mating-types are segregated in the first division, this pattern insures that the pair of nuclei in the large spore will include one of each type.

A complementary study of an eight-spored species, *N. sitophila,* was carried out at about the same time by Miss Margaret Wilcox under Dr. Dodge's direction. This investigation, together with later supplementary work by Dr. Dodge, showed that in that species, whose asci are relatively narrow, the nuclei from each of the three divisions come to lie one above the other in the ascus. Thus the two upper nuclei in the four-nucleate stage are daughters of the same nucleus of the two-nucleate stage, and so are the two lower; similarly the first and second nuclei of the eight-nucleate stage are sister nuclei, as are the members of the other three pairs.

The next step was to discover the pattern of distribution of hereditary factors in the eight-spored ascus. The tuft of asci from a perithecium was accordingly spread out under the microscope, and the spores from each of many mature asci were picked out in the order in which they were arranged in the ascus and grown separately. As a description of experimental procedure, nothing could be simpler; and if the spores were walnuts, the task would scarcely be onerous. But the spores are mostly less than 1/800 inch in length, and are produced in the same cultures with numberless conidia, of which a single one could give a false result.

What single-spore isolation involved was first the dissection under the dissecting microscope, with a fine sewing-needle and a steady hand, of the spores, with avoidance of the jostling which would change their relative position in the ascus. After transfer each spore was examined under the compound microscope to make sure that no conidia had been transferred with it, and afterward incubated for sufficient time to allow germination of any conidia that had escaped notice. Next the cultures were heated in an oven to a temperature that will kill any germinated conidia but merely encourage the sprouting of the more resistant ascospores; and finally a single branch of the mycelium ascertained to have arisen from each ascospore was cut off, under microscopic observation, and transferred to a sterile culture-vessel. The isolation of so many hundred single ascospores implies, then, the repetition of this procedure so many hundred times. When all this had been done, the resulting cultures were paired with each other in many combinations, to learn which of the mating-types each spore belonged to.

The results showed that in both *Neurospora crassa* and *N. sitophila,* spores 1 and 2 are always alike with respect to mating-type, and so are 3 and 4, 5 and 6, 7 and 8; but the pairs may be arranged in any possible pattern in the ascus; it may be that 1 and 2 are like 3 and 4, or they may be like 5 and 6 and different from 3 and 4. In the former case segregation has occurred in the first division; in the latter, not until the second.

Since 1908 there has been a continued and vigorous controversy among botanists concerning the life-cycle of Ascomycetes. One group has held that in a typical ascomycete, as in other organisms, there is only one nuclear fusion, which occurs in the ascus; and that, in consequence, there is only one reduction in number of chromosomes, that accomplished by the first two divisions. The other party has stoutly asserted that there is a second nuclear fusion, occurring before the formation of the asci; that, in consequence, the two nuclei that are to fuse in the ascus each possess a double set, and the ascus nucleus formed by their fusion a quadruple set, of chromosomes; and that inevitably a second reduction is necessary and occurs in the third division within the ascus.

The evidence advanced before the publication of the *Neurospora* work for each of these positions is that supplied by counts of chromosomes and from reported observations of nuclear fusion, or absence of fusion, in the young fruiting structure. Since the chromosomes in Ascomycetes are relatively minute, chromosome counts often are not reports of observation but interpretation. And what to one observer may be two nuclei lying next to each other, or one nucleus in the process of division, may to another be a stage in nuclear fusion. What, therefore, was needed was evidence of some other type. This is provided by the *Neurospora* studies.

If reduction in number of chromosomes should ever occur in the third division, the chromosomes that go to one daughter nucleus should not infrequently carry different hereditary factors from those going to the other, just as is true in the first division. In that case, sister nuclei of the third division should differ from each other. In

fact, however, they never do. In both *N. sitophila* and *N. crassa* the pair of spores enclosing sister nuclei — for example, spores 1 and 2 — are always alike. And in *N. tetraspora* the nuclei within a large spore are always different and always, as a result of invariable and elaborate manoeuvres, non-sister nuclei.

Similar data found many times in Dr. Dodge's later work, and in the later work of other investigators using the same test, always show the same result: there is no segregation of factors in the third division. There is nothing, not even a falsehood, harder to prove than a universal negative. Even so, without going beyond the limits of logic and often-confirmed evidence mycologists can now assert that there is a very high probability that neither the extra fusion and reduction nor third-division segregation ever occurs. High probability is scientific proof; and the proof here comes first and chiefly from *Neurospora*.

The study of segregation of mating-types in *N. sitophila* brought to light another important phenomena. Some of the mycelia were pale, fluffy, and without conidia, and could properly be described as albinistic; others were bright orange from the abundant conidia. This pair of factors, for albinistic and conidial, segregated just as did the factors for mating-types, but independently. Thus in one ascus, for example, spores 1, 2, 5, and 6 were albinistic and the rest conidial; but 1, 2, 3, and 4 were of one mating-type and the rest of another. (Cultures from these ascopores are shown in color on the back cover.) Furthermore, when albinistic spores of the two mating-types were paired, the albinistic character was passed on to the next generation, and so for the conidial. And again spores containing sister nuclei were always the same. The isolation of the albinistic strains gave a second pair of factors for genetical experiment; the pattern of their distribution confirmed the hypothesis of the single-fusion life cycle.

It was early apparent that because of (1) the ease with which they can be grown, (2) the presence in their life cycle of a phase of nuclear fusion and reduction, wherein hereditary characters may be combined and redistributed, and (3) their heterothallism, which implies that reproduction must result from the interaction of two individuals, the species of *Neurospora* furnish favorable material for investigating the phenomena of inheritance. Other organisms also possess these attributes — Mendel's peas, for example, and Morgan's fruit-flies. But *Neurospora* was shown by Dr. Dodge's work to possess other desirable characteristics whose significance is appreciable from a comparison with these other organisms.

In higher plants and in animals each gamete — egg, sperm, or pollen grain, which genetically is the equivalent of a sperm — is unique, or at least cannot with certainty be duplicated. In *Neurospora sitophila, crassa,* and the small-spore isolates of *tetrasperma,* on the other hand, any cell of a mycelium or of its innumerable conidia is identical with all the rest and will serve as well as any other in the making of crosses. Again, in the organisms that formed the material for the earlier genetic experiments it was not possible to utilize and test all of the nuclei resulting from the reduction of a single nucleus. In both animals and higher plants, of the four eggs potentially derivable from one cell three fail to develop; and although one cell gives rise, directly or indirectly, to four sperms that can fertilize as many eggs, no technique exists for isolating the four from one set.

In addition, one cannot observe the character of the gametes, but only infer it from their offspring. In *Neurospora,* the spores arising from one ascus can all be grown and their separate characters noted, after which the mycelia and conidia can be used in crosses. And again, in these other organisms the exact lineage of the gametes must remain unknown, whereas in *Neurospora* it is possible to know which spores (and mycelia) are sisters, which first cousins, and which second cousins.

As a result of these differences, there is a difference in the sort of evidence produced by study of the organisms. A student working with seed plants can say, for example, that of many thousand pollen grains placed on the pistils of a group of plants a hundred accomplished fertilization, and of these about half carried one factor and about half another. With *Neurospora,* it can be stated that of the eight mycelia from the spores of one ascus exactly half exhibited one set of characters and exactly half another and that segregation for these characters had occurred in a certain nuclear division. The ratios among the kinds of higher plants or animals resulting from any cross are variable: expecting 3:1, Mendel, for example, found ratios of 2.82:1 and 3.15:1; comparable crosses with *Neurospora* will give exactly 3:1. What can only be inferred from plant or animal genetics is observed in *Neurospora* work.

At one stage in the progress of his studies, somewhere near 1927, Dr. Dodge's administrative superiors concluded that his interest in *Neurospora* was verging on the pathological. The simple discovery of heterothallism in an ascomycete could not deserve all the attention that was being devoted to it. What the discoverer obviously needed was a rest. Instructions were accordingly issued for a mission to California on an unrelated subject. The rest, it may be assumed was appreciated; it is the only real break in studies that Dr. Dodge has continued to the present day, and that not only have confirmed the demonstration of the unique usefulness of *Neurospora* as a tool adapted to the solution of a wide range of biological problems, but have sharpened the edge of the tool and increased the range of its applicability. And where during much of its earlier history *Neurospora* was being studied by only the one investigator, since then it has formed the major scientific concern not only of Dr. Dodge, not only of others in his laboratory, but of individuals and research groups in many places, here and abroad.

It has been the subject of several detailed and important studies of nuclear and chromosomal structure and behavior. And by use of strains of *Neurospora* having special nutritional requirements, it has been found possible to learn many steps in the processes by which living cells build complex substances out of simple ones, and to cast new light on the invisible hereditary determiners located in the chromosomes. These last studies, in which *Neurospora* becomes a biochemical as well as a genetic material, have been pursued in several large institutions

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The Modern Dahlia

By **Charles H. Connors**

THE dahlia, from its very introduction, has been a popular garden flower. Hernandez, sent by King Philip II to Mexico to study the resources of that country in 1570, pictured in his posthumous book of 1615, two varieties that he had seen. It was not until the 1780's that seeds were sent to Abbē Cavanilles in Madrid and in 1789 the first ones bloomed. He classed them as *Dahlia pinnata,* but mentioned other species as *D. rosea* and *D. coccinea.* If we accept *D. variabilis* Voss this might account for some of the variation we find. However, there are distinct differences among the three mentioned. *D. rosea* has been suggested as the original of the old-fashioned dahlias. Apparently, there was no red in it. *D. coccinea* is described as red, scarlet, and orange. *D. pinnata* was a glaucous form with five-parted leaves and "plum"-colored flowers. *D. rosea,* therefore, contributed white and the xanthic colors and *D. coccinea* the cyanic range. *D. pinnata* is cyanic and also contributed to the variation in foliage.

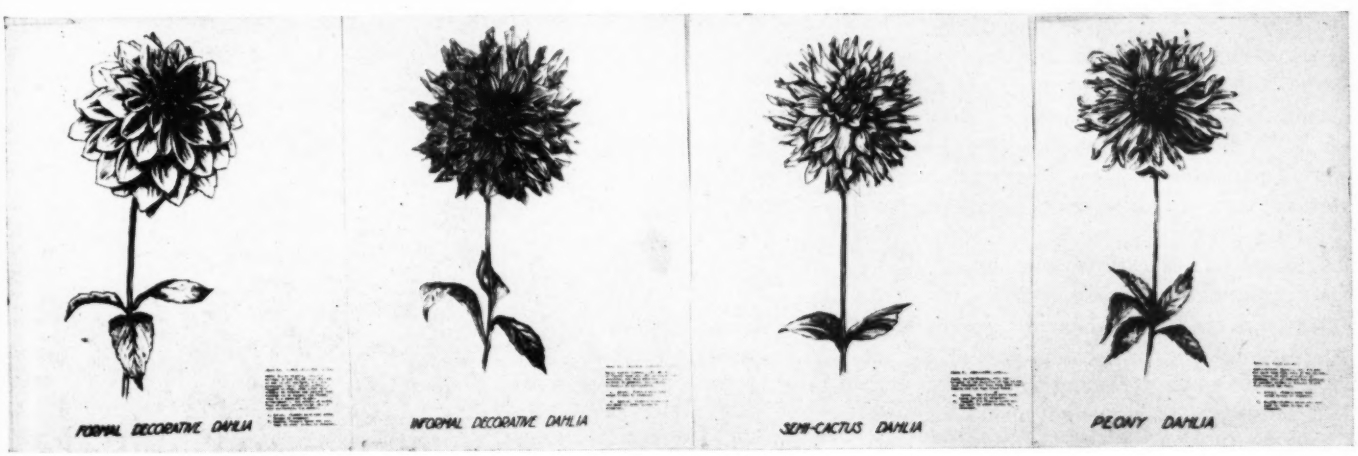
The dahlia is, in a sense, analogous to the tulip in flower coloring. At the time of the tulip craze, there were By-blooms and Bizarres. The By-blooms have a white background over which colors are laid, while the Bizarres have a yellow background. So we have, fundamentally, two color groups in the dahlia. One group, derived from *Dahlia rosea* has a white base and the other, from *Dahlia coccinea,* has a yellow base. To determine to which group any variety might belong, pull out a ray floret and examine the part that has been hidden from light. You can readily see that if a color, such as carmine, is laid over a foundation of yellow sap and pigment, the final effect would be quite different from that obtained when that same color, carmine, overlays colorless sap and white pigment, if such there be. In the latter case the effect would be carmine or perhaps rose, while in the first case it would be more like scarlet.

The original form of the dahlia was what we now call the single type, i.e., the disc surrounded by six or eight flat ray florets. That there were, in the wild, aberrant forms, such as we now call the duplex and peony types, with two or more rows of ray florets, there can be no question. While I have not been fortunate enough to have grown the Mexican forms from seeds collected in the wild, I have grown a tree form from Yucatan, *Dahlia Maxonii,* and have found among the seedlings some which bore duplex flowers. Some plants produced single and duplex.

It seems probable, from illustrations, that both single and duplex were grown in Spain and other European countries. These seem to have almost disappeared from cultivation and the extremely double type, which we call the ball, came into favor and in the 1840's and 1850's the shows and fancies, as they were called, became so popular, not only in England but also on the continent, that a craze for them arose that was second only to the "Tulip Mania" of Holland. These varieties were specified as three-fourths of a sphere in form, no disc florets showing. There were reported also "decorative" forms, no disc florets showing, and longer ray florets.

This shows the variation that can come about when many people are cultivating a plant, growing it both from seeds and from divisions.

In 1864, there bloomed for the first time in Holland, a new form which had come in a miscellaneous collection of seed, plants, and roots. One root survived and this produced a flower, the rays of which were revolute or curled backwards at the sides. It was called the cactus dahlia because of the resemblance to *Cereus speciosissimus* and was given the name *Dahlia Jaurezii* Hort. This became introduced into the complex of the modern dahlia.



A fifth species may be mentioned, although as far as we can ascertain, it does not enter the complex. *Dahlia Merckii* is much more slender than those previously mentioned. It is usually grown from seed and is valued especially for the fine cut nature of its foliage.

With the introduction of the cactus dahlia, there arose a new interest in the plant and it became increasingly prominent as a garden flower in all lands where it would grow. It was early introduced into this country and followed the same course as in other lands: the doldrums after the craze and then a revival after *D. Jaurezii.* New varieties were originated from seeds, obtained from insect-pollinated flowers. Some came with large flowers, such as "Uncle Sam" and the "U.S.A.," flowers up to eight or ten inches in diameter. But they nearly all had weak stems, so that the heads drooped. Then, in the late 1910's, John Harding introduced into the American strain a new variety from Holland, "Hortulanus Fiet," a large (for then) upstanding formal decorative. This marked the beginning of the dahlia of today. Such varieties as "Judge Marean," "Catherine Wilcox," "Agnes Haviland," and others created a sensation. These, thirty years later, are now only memories, although "Jersey's Beauty," a seedling of "Agnes Haviland," is still going strong. The introduction of these varieties resulted in a revived popularity. Somewhere along the line colchicine was used, and now we have monsters that range up to nineteen inches in diameter. Of course, some growing skill assists in the production of these giants.

New varieties came out in this country. Czecho-Slovakia produced many. Holland, Germany, and France have always grown and produced new sorts. More recently, Australia has come into the picture. England has introduced a number of varieties, but the growers in that country have been especially noted for the spider-like cactus varieties and also for the dwarf bedding types. From Holland have come many of the intermediate size with six- to eight-inch flowers.

Along with the development of the giants, especially suited for competition, has come a race with smaller flowers. The pompon, a special type of ball with flowers two inches or under, has long been in cultivation. Now we have miniature or small-flowered sorts in nearly every color and form possible. These are especially valuable for growing in flower borders, but they are also popular on the show-bench.

Mrs. Charles H. Stout, in THE AMATEUR'S BOOK OF THE DAHLIA, 1922, summed it up as follows:

> "And now what have we?
> So many forms we cannot classify them.
> So many colours we cannot describe them.
> So many varieties we cannot name them.
> So many admirers we cannot count them!"

This is even more true today. The American Dahlia Society (organized 1916) tries to maintain a list of varieties and so far more than twelve thousand have been recorded, chiefly of those originated in this country, although varieties of foreign origin have been included when they become widely grown. Every year fifty or more varieties are introduced. The American Dahlia Society has six trial gardens for the testing of new varieties. Each year, in one of the garden magazines, an evaluation is given, in advance of introduction, of the best new varieties, based on performance in gardens in at least four sections of the country.

The American Dahlia Society has set up certain standards, modified from time to time, in order to try to keep pace with the multitude of varieties introduced. These classifications seem to be demanded by reason of the keen competition on the show bench, for many flower shows are held throughout this country limited to this one flower.

One classification is according to size. The pompon type must be under two inches in flower diameter to attain perfection. The miniature varieties of the other flower forms range up to a maximum of four inches. The "B" or florists' varieties range from four inches to a maximum of eight inches, and there is a movement under way to subdivide this class, establishing a "BB" from four to six inches and the "B" at six to eight inches. Over eight inches are the "A" dahlias, or exhibition type. In competition, an undersized "A" may not be shown in a "B" class, but an extremely well-grown "B" dahlia may compete in the next larger class.

The second set of standards is for form. These range from the so-called singles through orchid, duplex, peony, and collarette, and anemone. The dahlia is a composite flower so that these forms exhibit varying degrees of exposure of the central disc. Then come the fully "double" flowers, in which no disc is exposed, most or all of the disc florets being transformed into strap-like flowers resembling the ray florets. These include the ball, the decorative (both formal and informal), and semi-cactus, and the cactus (straight or incurved). There are various modifications in the floret form. Some are rounded at the tip, or pointed; others are notched and even laciniate to the point of being called

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"Mums" the Word with My Husband

By **Sally R. Bullington**

R. Theodore Bullington with a collection of mums gathered from his Long Island garden. One of his favorites is the starry Yellow Spoon.

When we moved from an apartment to our long-dreamed-of house with garden space, I was still a career girl and had little time to participate in my husband's garden activities. Providence arranged my retirement from Wall Street the same year my husband joined the National Chrysanthemum Society. My only association with chrysanthemums up to that time had been at football games and autumn weddings — and my mother's beautiful chrysanthemum pattern damask banquet cloth which was family tradition on Thanksgiving Day.

In our garden during those early years, a few of the exhibition types of mums were planted in hit-or-miss fashion, and it appeared as though the place would be over-run with a "cushion" named "Santa Claus," given to us by a neighbor, which never made an impression on me. Gradually, since the days of "Santa Claus," the chrysanthemum has become part of my daily life. While the climax or grand finale happens to be in the fall, the other seasons of the year indeed have their share of importance and activities in the production of the blooms.

In midwinter, when the usual virus, or old-fashioned cold, puts my husband to bed, I can readily recognize, without the use of a thermometer, when his temperature is approaching normal and he is about to recuperate. I anxiously await that request for "a slice of ham for breakfast and all the mum catalogs you can gather." At that moment the chrysanthemum season has begun, for we are about to place our order for the year. For the next three or four days I wade through lists of mums with notes he has made on blossoming and pinching dates, colors of varieties, etc., until I wonder if we are to compete with such growers as Lehman Bros. or Bauer Steinkamp. However, the list gets whittled down, and I type the order which we vow is to be our one and only for the year. After the order is mailed, my husband recalls a memorandum made of some hardy garden varieties he liked in the very fine test garden at The New York Botanical Garden the previous year, or either one of us remembers a winning exhibit, or a novelty mum, at the last National Chrysanthemum Society Show. When the spring catalogs arrive, there are always new introductions which we cannot resist; before the planting season is over, I type four to six more orders.

I always like to order chrysanthemums because of the simplicity of names. One need not be a horticulturist or Latin scholar to pronounce or spell them. Long ago the ancient Chinese gave chrysanthemums such names as "Golden Bells," "Jade Bells," "Silver Bowl," "Jade Basin." Some were given the names of famous beauties or personalities, such as "Yang Kueifei" and "Hsishih." Today's "Silver Sheen," "Queen's Lace," "Sunglow," "Robin Hood," and "Nocturne" follow the old tradition. The National Chrysanthemum Society is to be congratulated for selections such as "Edith Roberts," "Elizabeth Hood," and "Mary MacArthur," named for the charming young actress daughter of Helen Hayes several years before her sad and untimely death. The only name that ever gave me trouble was "Nagirroc," which I nicknamed "Ragmop" because of its similarity to that old familiar household implement.

The March winds are still blowing when numerous empty wooden grape boxes (like flats) to be used later for mum cuttings are accumulated and stacked in the garage and basement of the house, until it looks as though we are stockholders in a vineyard. In April our orders are placed for peatmoss, fertilizers, insecticides, and flower pots, specifying May deliveries. So, in the merry month of May, I am practically confined to the house awaiting deliveries of garden materials and mum cuttings. Forty bags of dehydrated cow manure can certainly give a garage a barnyard aroma! I never can understand why mum cuttings on one order cannot be shipped at one time. Each order invariably arrives in several shipments. This year, however, I was able to work out a system with the expressman, who agreed to leave shipments of plants in a shady spot in the garden, if I happened to be out when he had a delivery.

About the middle of May through early June, my husband makes his own cuttings from plants that have been wintered over; and while these cuttings are rooting in the sand in the grapeboxes, it is my job to keep them moistened. It took me several years to learn the true meaning of "moisten." I no longer drench the cuttings out of the sandboxes. The neighbor's cats get all the blame now for that occasional ruined flat of cuttings. It is a happy day for me (about fifteen to eighteen days from the date the cuttings are placed in the sand) when I am shown some samples of well-rooted plants that are ready to be transplanted into the beds or pots. The plants are no sooner removed to the pots when the doorbell and telephone keep

me busy. I am deluged with questions. Somebody's "Albatross" died over the winter — has Bob got one to replace it? Why didn't "Mrs. Kidder" do as well for another grower, as she did in our bed of Kidders? What is the name of the pink variety that won high honors at last year's show? Can Bob talk to a local ladies' garden group and again tell them exactly how to make cuttings? What is the name of the shrub in our garden that is so heavily laden with orange-red berries at the same time the mums bloom — (pyracantha). And there is the lady from down the block who always wants to know if she can have one of those pretty pinkish bronze or bronzy pink mums that grow in this, that, or some other spot in our garden or mum beds.

I always try to be helpful but in most cases resort to chatting in a friendly way, preferring to let my husband discuss mum problems. One morning last summer, a gentleman called with a plant that puzzled him and his neighbors. He left it in a shady spot, asking that my husband examine it. Later in the day, I explained to Bob on the telephone that we had a mum covered with something resembling Spanish moss. I was quickly directed, in no uncertain terms, to hasten the plant from the garden and put it in a paper bag which was to be placed in a tightly covered receptacle until it could be properly disposed of later. I learned that the parasite "dodder" can play havoc in a neighborhood when once it takes hold. Since that time I see that any plants left at our house are carefully set aside for future inspection.

In July the pinching process starts and for the next month there are lengthy debates on the selection of terminal or crown buds. If my husband is not at home and the questions get too technical and involved for me, I always resort to "pinching is my husband's department." The first time he came home from a morning's work at court and said he had to pinch "Mrs. T. Riley," I had visions of one poor Irish woman standing in court for some misdemeanor. Now when he refers to pinching "Elsie," "Betty" or "Mrs. Kidder," I neither feel sorry for anyone, nor think he is misbehaving.

Spraying, too, is an important factor at this time — in fact, routine until color appears in the buds — for mums, like all other flowers, have enemies and diseases such as nematodes, the tarnished plant bug, red spider, and stunt that may strike down a perfectly good-looking bed of plants. We had one very unhappy experience, during the heavy spraying program, when my husband was silently accused of the death of a pet cat. Usually, the neighbors while walking their dogs chat with him as he works at his plot of mums. Suddenly, these same congenial folk walked frigidly on the other side of the street. Posters appeared nearby regarding the "poisoning" of animals. Finally, a five-year-old "pal" scornfully informed Bob that he was murdering cats with his poison spraying. As our own dog spends part of each day at the plot and was in perfect health, we investigated and learned that a fall from a second-story window had caused the death of the cat. Soon the neighbors and dogs came back to our side of the street. This same "pal" the previous spring removed all the name tabs from Bob's new mums and then tried to sell them to me "at a bargain." This youngster is destined to be a salesman, but even I balked at buying our own mum labels.

September brings the blooms of the early varieties; October and November, the harvest of our labors and the hope of a long autumn, mingled with the fear of a sudden, destructive frost or ice storm as appeared so early last year. Friends and neighbors, growers and non-growers, share the magnificent beauty as the colors of the many varieties unfold. The camera enthusiasts have a field day taking pictures until sundown and showing us their last year's pictures until midnight. Weekends become festive. I am hoping that some of the new 3-D cameras will be used in taking shots of our garden this fall.

Finally, the National Chrysanthemum Society Show at The New York Botanical Garden is on after months of preparation and hard work. Only those who have served on one of the show committees are aware of the amount of labor, time, and thought put into such a flower show. There is, however, fun as well as work. New acquaintances and lasting friendships are made. Each year brings new experiences. My first experience as a hostess at an N.C.S. Show was on a Sunday afternoon several years ago when the Garden invited the U.N. to see the show and for "tea." I was so worried that someone would ask me about a horticultural problem that I kept my eyes glued on Dr. Ernest L. Scott and Mrs. Edith Roberts in case I needed expert assistance. Last year,

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Mums on palette reflect autumnal colors in Mr. Bullington's exhibit at the Sixth Annual Chrysanthemum Show at The New York Botanical Garden in cooperation with the National Chrysanthemum Society

APPLIED CLIMATOLOGY

By Erwin R. Biel

The following has been extracted from a paper which Dr. Biel presented before the Section of Oceanography and Meteorology of the New York Academy of Sciences and is reprinted through the courtesy of the New York Academy of Sciences. ***—The Editor.***

CLIMATOLOGY is, at the present time, a rather neglected field. In the teaching of climatology, the statistical representation of data is often over-emphasized and, in some cases, the discussion of climatic problems is more or less restricted to certain basic chapters of meteorology. Applied climatology is hardly mentioned. Only since the translation of R. Geiger's book, THE CLIMATE NEAR THE GROUND, have certain phases of applied climatology been dealt with more frequently to some extent. Four of these phases are:

The ever-increasing industrialization of the United States, which creates serious problems of pollution in large cities and their surroundings and has caused sanitation engineers, charged with the tremendous task of air purification, to study the problems of "dust roofs." However, since the active surface in cities consists of asphalt, concrete, bricks, and similar materials, special micro-climatic problems exist, which are very different from those encountered over natural soil and vegetation.

The preservation of our forests and reforestation, which are now problems of nation-wide interest. Forest management profits highly from a detailed knowledge of the peculiarities of canopy interference, wind-breaking effects, the microclimate within the trunk space, and the particular features of the climate of rejuvenation glades of different sizes.

Shelterbelts, which are of vital importance in the interior of the continent, since North America displays the unique feature of having the highest average wind speeds in the innermost parts. Shelterbelts not only protect crops from mechanical injury, but preserve soil moisture due to reduction of evapotranspiration and reduction of snow evaporation. Since all microclimatic features are modified within the sheltered area, it is important to study the effects of composition, height, length, density, and shape of the belt. These problems interest not only the agronomist, but the rancher who must provide protection to his livestock during blizzards, the highway engineer concerned with snow blowing, and the architect concerned with the relation between windspeed and fuel consumption.

Frost protection, which is of particular interest in America with its frequent meridional surface-circulation patterns and its frequency of advective cold waves.

As these problems are covered in available literature, this paper will be devoted to certain studies conducted at the Department of Meteorology of Rutgers University.

One study carried out at Rutgers deals with the length of the growing season in New Jersey and the occurrence of frosts within this period. The common definition of the growing season, as the average duration of the frostless period, has often been severely criticized, and justly so, by H. Landsberg and others: The "killing frost" data do not refer to standard test plants, which are killed or injured by frosts of certain intensities, nor do they refer to minimum temperatures measured within the micro-layer. In most cases, they simply indicate that the minimum screen temperature reached the freezing point. R. Geiger and others have shown that such data are not representative at all as far as effects on vegetation are concerned. The definition frequently used by agronomists and ecologists ("vegetative growing season"), which is based upon the "zero of vital temperature" (about 43° F. for many common plants), is much more useful. Naturally, "individual zeroes" (average temperatures at the average time of planting) have to be used in studies on individual species. A set of maps was completed for the State of New Jersey showing the beginning, duration, and end of the vegetative growing season. The period in spring, after the start of the vegetative growing season and before the start of the frostless season, is of particular interest to the farmer. This period of anxiety is rather short along the immediate coast (two weeks), increases to four weeks in central New Jersey, and to six weeks in the inversion basins of the northern hills. Similar conditions prevail in autumn after the end of the frostless season, and previous to the end of the vegetative growing season. The frequency of frosts during these biologically significant periods was studied, and the results indicate clearly that frosts never failed to occur during those periods, reaching amazing frequency values in years with very late spring or very early autumn frosts. Thus, frost-chance tables were calculated in a manner similar to those offered by Thom and Shaw for Iowa. The chance of occurrence of frosts after the median date of the "last killing frost" is still fifty per cent. If this risk seems too high, it can be reduced to any desired percentage by the use of the frost-chance tables. Numerical values were offered for New Jersey spring and autumn conditions. Shaw has also studied the frequency of frosts of certain intensities and similar studies are now under way for New Jersey.

The question of the frequency of genetic frost types is of great practical importance. Radiation frosts, associated with sharp inversions and very low wind speed, are mostly spotty, and protection is promising; while widespread advective frosts offer much more serious problems. Heaters work only with inversions (if the small effect of direct radiation is neglected), and their effect is the more pronounced the sharper the inversion, or, in other words, the lower the level at which the heated air stops rising. Ventilators and helicopters naturally work

only with inversions. In California, ninety per cent of all frosts are of the radiation, and only ten per cent of the advective type. C. Janifer showed recently by an analysis of three years of central New Jersey data that approximately one-third of the frosts, occurring during the spring period of anxiety, is advective in nature. Thus, the New Jersey farmer has to familiarize himself with the properties of genetic frost types, with the relative merits of frost protective measures and particularly with the physical basis of protection by infra-red radiation.

The variability of the amounts of the annual and growing season precipitation was studied. New Jersey compares very favorably with most of the rest of the United States and of the globe as far as the reliability of its annual precipitation amounts is concerned. The same holds true with respect to the standard deviation of the rainfall occurring during the vegetative growing season. Since, however, agronomists are more interested in precipitation frequency than in amounts (the growing-season precipitation, in spite of prolonged droughts, may be high, due to cloud bursts and hurricane tail ends in autumn), the reliability of the frequency of rain during the vegetative growing season was likewise calculated. The results indicate that in New Jersey the number of rainy days during the growing season is likewise rather dependable in comparison with other regions. Figures on raininess (amount of rain per rainy day) are significant with respect to soil erosion, to the washing-out of fertilizers and so on. It is, therefore, regrettable that hardly any maps on raininess seem to exist. J. Caprio used, in a study on dry spells, the conception of the "drought index," as introduced by W. Schmidt, the index being based on weighted values depending on the length of the drought. This index was used to determine the maxima of consecutive rainless days which a New Jersey farmer has to be ready to face month after month.

J. Cantlon of the Botany Department of Rutgers University completed a study on exposure microclimate, based on measurements at different levels above ground on the northern and southern side of a hill in northern New Jersey (Cushetunk Mountain, altitude seven hundred feet), the stations being close to the summit. While the general differences in exposure microclimate, with respect to soil temperature, soil moisture, wind speed, forest fire danger, growth rate, etc., are well known, it was unkown, previous to Cantlon's study, to what extent these differences increase from the canopy to the moss level. The degree of vegetative differences as defined by the ecologists more than doubles from the tree to the bryophytic level.

The dusting of forests and crops from airplanes against insect pests is becoming a common practice. R. Geiger has shown that wind speed and turbulence, during the very short period between the release of the minute particles from low-flying airplanes and their arrival at the canopy level or at the ground, are very significant factors for the success or failure of the dusting operations. On fair days, dusting is most successful during the hour after sunrise or during the period before sunset. The morning hours are preferable, due to lesser turbulence and higher relative humidity which is associated with higher adhesivity of the particles. Under East American conditions, the probability of rain falling during the hours after the dusting operation, which would knock off the particles, is much less with morning than with evening dusting, since intense rains from convective clouds are primarily a phenomenon of the later afternoon and early evening hours.

The interdiurnal variability of temperature is a significant indicator of the dynamic structure of a climate, and has also widely been used as an indicator of climatic health values. New Jersey's values are extremely high. There are naturally regions with greater thermal fluctuations between successive days, but most of the centers of high values of the isometabolic lines are located deep in the interior of continents in the neighborhood of the continental "poles of cold," and not in the immediate vicinity of an ocean. These variations, due to frequent air-mass changes or to rapid modifications within air masses, represent not only a great strain on human health and on plants but are also a stress on building materials. The rapid weathering of the hieroglyphics of New York's Egyptian obelisk offers a good example. When the obelisk was brought to New York in 1879, the 34-century-old inscriptions were well preserved, but they have suffered very severely, after only three-quarters of one century, from the heavy rains and drastic air-mass changes that characterize our climate. The calculation of the interdiurnal variability of equivalent temperatures would, by the inclusion of moisture, cover the combined effects of temperature and humidity.

In the opinion of the author, climatology is basically the physical geography of the atmosphere. The climatologist describes as a first step the facts and represents them by a variety of statistical methods. Purely descriptive and statistical climatography, however, is elementary and unimpressive. The climatologist needs the results of meteorological research in order to explain the phenomena described. He also needs some knowledge of agronomy, ecology, and other sciences in order to apply his findings to a great variety of human activities.

CLARENCE LEWIS' LIBRARY **(from page 139)**

The library also has a facsimile reprint of *Divers Chimicall Conclusions concerning the Art of Distillation,* printed by Peter Short in London in 1594. This title is incorporated in that of the 1653 edition of the *Jewel House* mentioned above, and presumably contains some of the same matter. The exact history of these paragraphs which appeared under various titles can be understood only by comparing all the original editions. The above-quoted remarks on the care of the teeth, for instance, are found also in the 1653 edition of the *Jewel House* (with a few verbal differences, as "men" instead of "gentlewomen"); but I do not know, without having seen the first edition, whether this contained the paragraph in question, or whether the latter was added later in enlarging this popular work. The small work entitled *Divers Chimicall Conclusions* contains, besides some of the author's recipes, a general account of the art of distilling, with woodcuts of the apparatus to be used.

(To be continued)

WILD FLOWERS

in The New York Botanical Garden - III

By **Joseph Monachino**

With the encroachment of housing developments, golf courses, and automobile highways into the few natural areas still remaining in the New York City region, the protected areas become more and more valuable for the study and enjoyment of natural life. The wild-plant sanctuary on the grounds of The New York Botanical Garden is one of the best of its kind in the vicinity.

How much of the City's wild has vanished! It seems just yesterday that the dunes at Marine Park in Brooklyn were in their pristine naturalness. The writer recalls how, but a short time ago, he walked amongst the waist-high yellow-fringed orchis at Idlewild in Queens. On a trip there in 1940 he recorded clubmoss and sundew, yellow-eyed grass, meadow beauty, and golden hedge-hyssop. Now there is an airport on the site. The lovely meadows around Baisley's Pond have been cleared. The Juniper Swamp near Maspeth is lost, and little remains of the Kissena Swamp in Flushing. The northern part of the city has suffered too, as witness Inwood and Fort Tryon and High Bridge. The section of the Palisades opposite New York City is reduced to a narrow shore-path for the hiker. The Van Cortlandt Park "sanctuary" is surrounded by golf-courses and is fenced in. Improvement by bulldozer has invaded all fronts in the city, from Clove Lake in Staten Island to Pelham Bay Park in the Bronx. Little is spared or can ever be again reclaimed.

Not even The New York Botanical Garden has escaped entirely. Large sections have been appropriated for citification. The area of the Garden has been reduced from about four hundred to two hundred thirty acres, which is approximately what the original area was in 1895. A strip east of the Park has been used to build a highway. The Old Lake Valley in the southeast is gone. The North Meadows are now outside the Garden. The type tree of *Fraxinus Michauxii,* named in 1905 by the late Dr. N. L. Britton, the first director of The New York Botanical Garden, was discovered in the North Meadows. Although the species is now regarded as *F. tomentosa* and also has been found wild elsewhere in the City (near the reptile house in the New York Zoological Park), there is historical interest attached to the type. In spite of all that has been lost, let us be thankful, however, that the best natural area of Bronx Park still remains with us, the Hemlock Forest and the Bronx River Gorge.

Some flowers reported from the Garden in 1899 and 1900 have not been located by the present writer. A report on the wild flora on the grounds appeared in the first volume of the Journal of The New York Botanical Garden (No 4, pages 195-203, and No. 5, pages 392-393). Here are some of the more showy flowers listed, which have not been seen wild on the grounds within the last ten years: *Lobelia cardinalis, Veratrum viride, Gentiana Andrewsii, Habenaria lacera.* Have these disappeared? Can the reader find *Comandra umbellata, Saxifraga virginiensis, Silene caroliniana* subsp. *pensylvanica, Aquilegia canadensis?* The species listed in the two previous parts of "Wild Flowers in The New York Botanical Garden" are still in the Garden, as of this year. With the exception of the aster, it should be very easy to find the species mentioned on the grounds during September and October.

Humulus japonicus has opposite palmately three-to-seven lobed serrate leaves. The stipules appear as interpetiolar bilobed appendages. The striate stem twines from right to left or counterclockwise, looking from the base upwards. It is very harsh with peculiar trichomes, short pungent hairs attached near the center and sharp at both ends. The rigid shaft of these hairs can be see-sawed on its bulbose fulcrum. Ordinarily the lower arm is raised, so that the stem and petioles are rougher when stroked upwards. The very young growing stem and leaves are dusted with glandular granules. The cotyledons of the seedlings that appear in April are linear. Of the two species of hops found in the vicinity of New York City, the Japanese hop is the more common.

Phytolacca americana is a stout herb with the white or pink flowers in racemes opposite the leaves. The pedicel is subtended by a bract. Also there are two bracts on the pedicel itself, in the axil of which are undeveloped flower-buds. Secondary flowers sometimes develop in the lower part of the raceme. This suggests that the inflorescence is possibly a panicle with arrested development of the lateral flowers. The sepals are five, the stamens and styles usually ten. The pouches of the anthers are free, except where a narrow connective unites them. The berries contain a dark purple juice, which gave the plant the name inkberry. It is stated that no mordant will fix the rich purple color that would otherwise be economically valuable. The interior of the stem is partitioned by thin horizontal membranes. The leaves somewhat resemble those of belladonna (the scoke has also been called American nightshade). The young leaves and sprouts are eaten like spinach. When the poke matures, the stem usually becomes claret-red; this is said to be a danger signal, indicating the herb has reached the poisonous stage. The large perennial parsnip-like root can cause acro-narcotic poisoning; in medicine it is used as an alterative in chronic rheumatism, an emetic and cathartic.

Polygonum caespitosum var. *longisetum,* although the most common species of the Persicaria section of genus in the Garden and many other places, was not listed in the previous editions of the Illustrated Flora and Gray. Its rosy flowers are most showy in autumn, although they may have appeared as early as May. The species is said to have been first collected in America in Pennsylvania in 1910. The first published record of its occurrence was written in 1930. A very comprehensive history of the introduction and collection of this Asiatic lady's-thumb was presented in 1941 by Dr. H. N. Moldenke in "Torreya."

Tovara virginiana is placed under a section of *Polygonum* in the New Illustrated Flora, whereas the genus *Tovara* was recognized in the Britton and Brown edition. Good arguments for the retention of the genus were presented in 1952 by Hui-Lin in "Rhodora." Besides its floral distinctiveness, *Tovara* belongs to the remarkable group of plants that show a disjunct geographical distribution. Closely related species are found in eastern North America and eastern Asia and are lacking elsewhere. The two-parted style is persistent in *Tovara;* it becomes elongated, indurate, and hooked at the apex. The flower is soon deflexed on a pedicel that develops a spring-action at the joint. When the matured fruit is touched it jumps, whence the name jumpseed. The Virginia knotweed has a strong rhizome. The leaves display a silky sheen as seen in some species of anthurium. The young leaf-blades often have the V-shaped mark of the lady's-thumb.

Impatiens biflora is easily recognized by its drooping spurred irregular flowers (lady's earrings). The spur of the petaloid calyx is inflexed, giving the flower somewhat the appearance of a liberty-cap. The mature capsule suddenly bursts open violently when touched, projecting the seeds, whence the name touch-me-not. The seeds are oblong-quadrate, drab brown. Removal of the jacket reveals the amazingly blue, robin's-egg blue, cotyledons of the embryo. The seeds taste strikingly similar to walnuts. In the springtime abundant seedlings can be found in wet places. Their succulent cotyledons are opposite, emarginate at the apex, otherwise entire. The blooming period starts in June and is about over in September. According to B. L. Burtt and M. L. Fernald, *I. capensis* is the earlier name for the species (see the 1948 volume of "Rhodora"). The name was based on a cultivated plant erroneously believed to have originated from the Cape in Africa. The species is said to be now completely naturalized on the banks of the Thames in England.

Aster acuminatus is found only at one place on the grounds, by an old wall east of the Bronx River. The inflorescence is corymbiform, the rays are white, the phyllaris are sharply pointed. The leaves taper at both ends. They are usually crowded towards the upper part of the stem, which suggested the name whorled aster. The species was formerly rare, now is either lacking or very rare elsewhere in the City. The present report is the first noting of its occurrence in the Garden (the writer's collection of August 15, 1941, is a voucher). There are instances of native flowers planted on the grounds unofficially. The mountain aster has scaly rhizomes which make transplantation easy, and there is no assurance that the station is not the result of human intermediation.

MODERN DAHLIA (from page 144)

staghorned. In some varieties, the style and stigma of the ray florets is transformed to petalloids.

Mrs. Charles H. Stout, who was an artist as well as an outstanding horticulturist, a few months prior to her death, had prepared and copyrighted a set of drawings which depict as accurately as can be shown, the flower types as set up by the American Dahlia Society. These we are permitted to reproduce through the courteous goodwill of the copyright owner, Mrs. Richard W. Lane (Virginia Stout) of Short Hills, New Jersey.

There are intergrades, of course, but the joint committee of the American Dahlia Society and the Central States Dahlia Society, each year publishes a list giving the size, type, and color classification of all varieties prominent in the trade. These standards are based on the performance of the particular variety under optimum conditions.

The third classification is that based on color. As was pointed out earlier, the two color series are present in the dahlia, the cyanic or yellow-orange-red, and the xanthic or violet. There is apparently no blue pigment present. The color classification is based generally on the pigmentation of the face of the ray, although in some varieties the ends of the rays may curl and the color of the reverse may influence the effective color of the variety.

The joint committee has set up fourteen color groupings that are used in preparing show schedules:

White: pure white, ivory, cream, and faint blushes of other colors.

Yellow: straw, sulfur, lemon, primrose-yellow, apricot-yellow, golden-yellow, and chrome-yellow.

Orange: cadmium-orange, apricot, tangerine-orange, chrome-orange, and orange.

Flame: spectral blends, xanthic in origin, of scarlet-red or orange with yellow.

Autumn: buff, yellow-ochre, tanned and grayed suffusions and blends of such tones with pink and lavender.

Red: mandarin-red, vermilion, scarlet, crimson, cherry and currant-red.

Dark Red: cardinal, oxblood, maroon.

Pink: shell-pink, salmon-pink, coral-pink, rose and Tyrian rose.

Lavender: lavender, mauve, and phlox-pink.

Purple: rosy magenta, dahlia-purple, amaranth-purple, and violet.

(Blend: those having no clear and distinct color, instead having two or more intermingled colors of different color classes which gradually merge but each of which can be distinguished at a distance of six feet).

Light Blend: blends of the lighter tones of pink, yellow, lavender, and other pastels, and also to include two-toned varieties of pastel tones in which the central rays are of different color than the marginal rays.

Dark Blend: blends of low brilliance, of dark reds, maroons, purples, or other dark cyanic blends with contrasting color or colors.

Bi-Color: varieties having two or more distinct clear and separate colors on the face of the floral rays.

Variegated: Varieties having two or more distinct colors on the face of the floral rays, arranged in dots, flecks, splashes, or narrow lines which contrast sharply with the basic color.

Spring Flowers
SEEN IN
Israel and Greece

By **Helen M. Fox**

View of Lake Kinnereth. Right: Ropernaum, the Mount of Beatitude.

WHILE I was in Israel during the month of March, it rained part of almost every day. I was told this was the rainiest season in a long time. Instead of worrying about the dryness as was their custom, the people were concerned about getting too much moisture for the crops. However, the result of rain on wild vegetation was to make it lush, vigorous, and of brilliant coloration. Most of the land was clayey and because of the rain of a sticky consistency. One's feet stuck in the ground and came up coated with mud. This was particularly true around the sea of Galilee and on into Upper Galilee. On the Judean hills where Jerusalem is situated, the earth was not so sticky; although where the ground was level, it was muddy, too. However, around Beersheba on the edge of the desert, the earth was somewhat crumbly.

In the short duration of my visit, there was no time to dry and press the plants I saw, nor would there have been space to pack them in my streamlined airplane luggage. When I returned home and went to The New York Botanical Garden to check the names of the plants I had seen, I was properly scolded by Messrs. Everett and Alexander for my omission. Unfortunately, for this reason, some of the names in this story are approximate. I do think I have the correct family in almost all cases, if not always the right species. The purpose of this article is to show how rich and varied is the flora in this part of the world and how challenging to a gardener to try out some species hitherto unknown to him in his or her garden.

Somehow in regard to Israel one reads and hears much about human accomplishments and little space has been given to the beauties of the countryside. Along the coast there are always views of the Mediterranean, and as soon as one comes to the mountains, such as the Mt. Carmel range and the Judean hills, there is drama and variety. Upper Galilee, with its lush green hills, its flourishing olive orchards, and the sound of rills and brooks in the meadows north of Lake Huleh, with the whole scene dominated by snow-capped Mt. Herman, is particularly appealing. Always in this ancient land wherever one goes is some reminder of the Bible. This is especially so in Lower Galilee. The scenery around Lake Kinnereth—the Hebrew name for the Sea of Galilee because Kinnereth means harp, the shape of this medium-sized lake—with a series of gently undulating hills, green with spring crops and punctuated with exquisite and often highly colored flowers, has an air of being a creation of the imagination and not a reality. I spent a week at Tiberias on the shores of Kinnereth and went for walks every day into the countryside searching for flowers. A month could be spent and new flowers found continually to add to the list.

On the hills around Jerusalem by mid-March there were patches of *Anemone coronaria*. Here they are deep ruby-red; farther north there are also blue and variegated color forms. Their stems are sometimes fifteen inches high. They grow in drifts all through the mountains. These drifts are characteristic of the way most wild flowers grow and show how much more attractive is this scheme of planting than the "mixed border" so popular in our gardens. We "mix" because most of us are collectors, but the more one studies Nature's way, the better one understands why the elimination of the unessential is a basic rule of artistic expression. In my opinion, even the owner of a small plot would have a better looking garden if he confined himself to growing many of a few flowers rather than few of many.

Other flowers that bloom as if dotted through the hills are *Cyclamen persicum* in goodly sized clumps. The blossoms are white with red lines, appear roseate, and measure about one inch across; their stems are over twelve inches high.

On the way to Beersheba there is a planting of trees along the roadside. These had been watered and certain wildlings had appeared adventitiously. In a garden at Beersheba I saw *Convolvulus altheaoides,* spreading on the ground, and *Malva sylvestris* with round heart-shaped, dentate leaves and pink flowers.

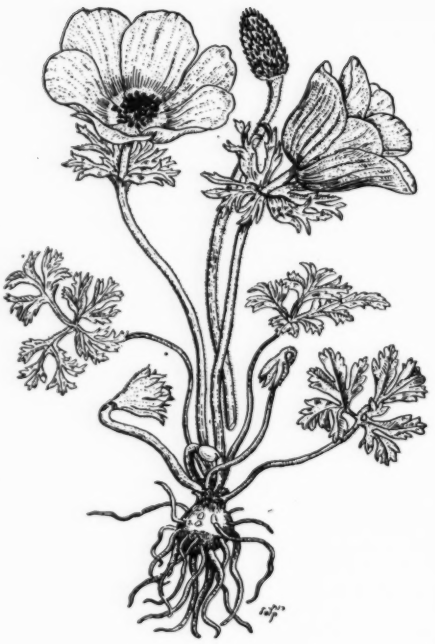
At Haifa, a city that climbs the Mt.

Carmel hills similarly to an amphitheatre, I saw *Cercis Siliquastrum* growing wild on the steep slopes and pink and white-flowered rose bushes. I think the rose was either *R. dumetorum* or *arabica*. It was very bushy. While looking at the rose bushes, I met a grandmother taking care of her little granddaughter and heard she had come from Hungary where she had owned a beloved garden.

The Mt. Carmel range is one of two places where *Lilium candidum* is native, the other is Upper Galilee. Here, too, rosemary ramps. In the gardens there was a good deal of *Rosmarinus officinalis* var. *prostratus* with deep blue flowers. In gardens, too, I saw *Lavandula dentata* which was clipped to make a low hedge. It had become a thick shrub with deep purple flowers and was deliciously fragrant, which it is not in my garden. I was told *Lavandula officinalis* blooms all summer and roses bloom from October to June and seem to thrive. Orange trees were in flower in March. In some places the usual annuals, calendulas, petunias *et al,* were being grown. I have sent seeds of California annuals in the hope they will become established and increase the palette.

When I came to Ilanoth situated not far from Haifa, Dr. Amihud Goor had

Cyclamen persicum Mill.



Anemone coronaria L.

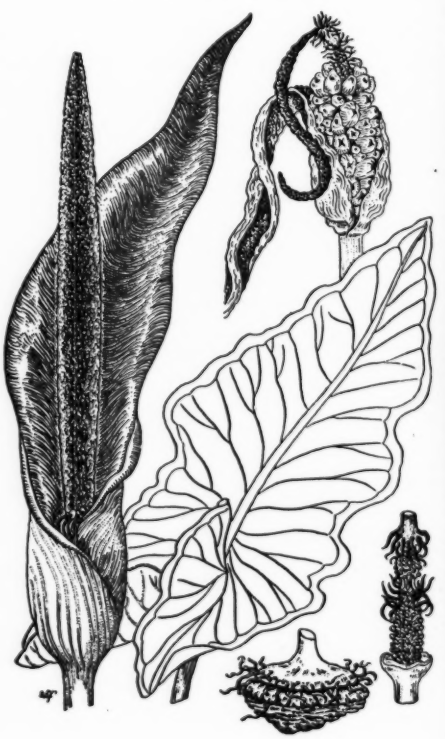
me driven out to the sand dunes along the coast and there I had a great treat. For the first time in my long life I saw tulips growing wild. It is thrilling to see a plant known only under cultivation in its natural environment. They were *Tulipa Oculus-solis*. Among them were large and frequent clumps of *Iris atropurpurea*. The beautifully formed flowers are of varying shades of dusty purple and exactly the right size for the height of the stems which were about fifteen inches tall. In these sand dunes there was a light blue *Lupinus angustifolius*.

In Upper Galilee, in the shade of the famous oak grove of Bash-on, I found a calla lily, probably *Arum palaestinum*. The spathe was green outside and marked with dark purple. It was about twelve inches high. Here, too, where the land is moist, I found a tall member of the parsley family, with pleasant tasting leaves. I think it is *Angelica sylvestris,* which is reported to grow beside mountain streams. In the fields seen from the road were large clumps of *Euphorbia* which might have been *polychroma*. In these fields, too, were pinkish red patches of *Silene,* either *coniflora* or *conoidea,* which are annuals and grow twelve to fifteen inches high. And there were plants of *Erodium gruinum,* purple stork's bill, with conspicuous violet-blue flowers, leaves sharply and irregularly toothed, and the typical needle-like capsules of the family. There was a plant whose stems, leaves, and buds looked like those of calendula but the flowers were tiny. This is either *Taraxacum cyprium* or might be a crepis.

Coming down from the highland towards Tiberias which is six hundred eighty-two feet below sea level the hills, in places, were carpeted with *Ornithogalum nanum*. Right in the valley growing on shaded cliffs was *Ornithogalum brachystachys*. This last looks something like a camassia, having green stripes on the back of the sepals, and the flowers grow in a spike, whereas in *nanum* they grow singly. There were brilliant purple patches which proved to be *Salvia Horminum,* an annual I grow in my garden, where is self-sows. The flowers are bicolor and inconspicuous, while the terminal bracts are a vibrant deep blue-purple. Here, too, was *Reseda odorata,* rather weedy looking but smelling as it should. There was also *Salvia pomifera* and *Salvia triloba,* the last with tall white spires of flowers and humpy, strongly smelling leaves.

On the slope going down were *Anchusa paniculata* or *angustifolia* and *Echium polychroma,* the last with masses of yellow-red flowers which

Arum palaestinum Boiss.



later turn deep blue. They were both tall, bushy, and striking. All through these hills and north to the border, *Coriandrum sativum* is found, among grasses. It is bushy and pleasantly fragrant, much pleasanter than it is in captivity, anyway in my garden. I was told origanum and thyme grow wild but did not find any.

From the hotel where I stayed, which is right on the shores of Kinnereth, a walk leads through a highly fragrant weedy meadow to the ruins of old Tiberias. Here grows a matricaria with large yellow flowers borne singly on stems eighteen inches high. There is also a member of the daisy family, probably *Chrysanthemum coronarium,* which is low and has white flowers. Nettle is so lush it looks like mint from a distance. There is also a weed with delightfully fragrant flowers, which I think is *Chenopodium murale*. The leaves were large and toothed. Mustards, *Brassica nigra,* grow two feet high and the panicles of flowers are so huge they are stunning. Always there are clumps of *Asphodelus fistulosa,* a tall plant with white flowers tinted pale salmon. It is handsome but by the time one comes to Greece has become an undesirable weed covering waste places in huge drifts.

From the meadow the walk leads into the ancient walled town built by

Ornithogalum brachystachys C. Koch

Herod and later occupied by the Arabs. In the distance I could see the minaret of a mosque and went towards it through narrow twisting old streets until I came to the arched entrance. There to my surprise, instead of devout moslems about to enter their holy mosque, I saw a big sign "Refrigerators repaired."

My companions at Tiberias were a German refugee doctor and his wife, who were both keen about flowers. They drove me to a nearby old Arab town now called Migdal, once the home of Mary of Magdalen, and a little farther on to a valley called Vadi Natufah. A stream runs through it and it is contained by odd-looking stone cliffs. One particularly stands out like a rough column, or gigantic human figure. I thought it might be the Pillar of Salt but was told it was not and that no one really knows where Sodom and Gomorrah were. This valley is so filled with flowers it looks like a gigantic rock garden. There were far too many flowers for me to identify. For botanies I had two volumes of FLORA OF THE LAND OF ISRAEL, by Dr. Michael Zohary, and a charming little book he gave me called FROM CEDAR TO HYSSOP by Crowfoot and Baldensperger. I should have had Post: FLORA OF SYRIA, PALESTINE AND SINAI. And I should have stayed there for at least a month.

In the valley I saw many kinds of vicias and a plant which is probably *Tetranolobus* with broadly pinnate leaves, the terminal ones tinted ruby-red and the whole flat on the ground. There was *Hyoscyamus aureus,* golden henbane, with bright yellow flowers, and an enchanting light pink cress with deeply cleft petals called *Malcomia,* makholmia by the natives. I cannot tell which species it is, now. There was *Adonis microcarpa* with dark red poppy-like flowers and ferny leaves. Carob trees are here, psoraleas and many kinds of clover and brooms.

I drove to Nazareth, past beautifully neat fields cultivated and owned by Arabian Israelis, in a car with an English-speaking driver whom I told before I started that I wanted to stop now and then to look at the flowers. He told me his wife loved them, too. When I saw a flower new to me he would get out of the car, plunge into the mud, and bring back a large bunch of it. Once it was *Iris palaestina.* Each stalk is eighteen inches high and bears several flowers, all blue except for a white patch on the falls. He also brought me *Lupinus pilosus* which grows bushy, about eighteen inches high, and has dark blue flowers with a white spot. This I was told later is the only place where it is found. We

Ranunculus millefolius Banks et Sol. var. *hierosolymitanus* Boiss.

Althaea acaulis Cav.

Chenopodium murale

found *Phlomis viscosa,* a lovely plant with fairly large yellow sage-like flowers, and *Scabiosa prolifera* with cream-colored flowers tinted with pale green. It, too, is bushy, softly hairy, and has longish leaves with wavy margins. This is a plant I highly recommend for the border.

Ruta chalapensis looked so different from *Ruta graveolens* which grows in my garden I had to taste the leaves to make certain it was a rue. This near eastern rue has finely divided leaves and large clusters of yellow open flowers with fringed petals. I saw this plant on the way to Mt. Tabor from Tiberias.

GREECE

I left the airport at Tel Aviv at 10:30 in the morning, in the rain. Soon the clouds parted, and I could see the Aegean below and thought of Icarus, as I looked down on Rhodes and the Cyclades Islands set in the sea which did appear "wine red," in places as Homer had described it. Upon landing in Athens at half past two in the afternoon, it was surprising to see how dry and dusty everything was.

Two days later I drove to Delphi to spend the night and saw wonderful flowers on the way. However, I was in a bus on that trip and could not stop to get out and look closely. Another time on the way to Corinth, down to Mycenae and on to Epidaurus, I had my own car and could do this. In the fields on the way to Delphi here and there were patches of sky-blue. When I picked the flowers I saw they were a kind of clover which I cannot identify. There was also clumps of deep purple iris. The flowers of these were quite large and superficially looked like one of the Germanicas. Everywhere was the little white daisy I saw in Israel. At Delphi *Euphorbia polychroma* was four feet or so high, much branched, and tipped with mustard-yellow. It grows thickly in the lower ruins. Here, too, was *Anemone coronaria* in all colors of its tribe and in drifts. The dryness of the climate caused the anemone, as it does most flowers here, to be dainty and low, and it looked entirely charming among the orange pink stones of the ruins. *Ornithogalum* was as frequent as grass; it was probably *nanum.*

On the way to Corinth, close to the bay of Salamis, the hills are covered with thyme, *Thymus capitatus,* the thyme of Hymettus. It was twelve inches high and quite a wide little bush, and is said to have purple flowers. Here and there among the thymes were clusters of beehives painted light blue, a favorite color of bees. The honey is delicious and has the tang of thyme, not as stronge as in some other thyme-flavored honeys. There were many brooms with yellow flowers. At the ruins of the famous sanitarium of Aesculapius at Epidaurus grape-hyacinths and ornithogalums as also anemones grew in great swathes. The grape-hyacinths were not over four inches high and made deep blue patches. Along the roads wild white and pink prunus were in bloom, either a peach or an almond. They were fluffy and roseate against the gray-green of olive trees or the deep green of oranges. The scene was punctuated by the black clothes of the peasant women, each with a snow-white kerchief on her head, still tied to hide the lower portion of her face as the Turks must have taught her.

The flowers in Attica on the way to Sunium, where the temple to Poseidon is situated on an arm projecting into the sea, are deservedly famous. Here were huge bushes of rosemary with deep blue flowers, but what gave

Tulipa Oculus-solis St. Amans

me the biggest thrill were carpets composed of pale yellow *Alyssum saxatile citrinum* and purple. *Aubrieta deltoidea,* probably var. *graeca.* At the steps of the temple were lovely pink vetches two inches high and everywhere the most beautiful and decorative clovers. There is something about the atmosphere in Greece which makes all objects stand out in all their outlines and seem to explain the clarity of thought and sense of balance, that characterizes the art and literature.

"MUMS" THE WORD **(from page 146)**

I was delighted to be able to answer all sorts of questions about the colorful table settings on the balcony, but I had to call on one of the employees of the Garden for information about the origin of the "Museum piece table" that was pushed aside for the duration of the flower show. It attracted much attention. I was informed the table came from the Florida Exhibit at the World's Fair in 1938, the top being made of bald cypress knees. The legs are of one piece, apparently made from a three-forked trunk of a live oak, the piece being cut just above the fork.

This year, for the first time, the N.C.S. show will be held in the Conservatory of The New York Botanical Garden, bringing new ideas and experiences.

CITRUS - World Traveler Extraordinary

By **William G. Mitchell**

THE saga of citrus reads like a travelogue narrated by a globe-trotter. It also has features worthy of a complete history of the world, since citrus —its cultivation has grown along with mankind himself — has spanned the centuries from antiquity to the present. Again, there is a swashbuckling, swaggering, adventurous flavor to the tale such as you might find in the best of historical romances.

The story of the genus citrus began long ago in ancient China — somewhere in southeastern regions of Asia, where some scientists believe the human race itself had its origins — before the beginning of recorded history. It was at that time, as it has been since, the fruit of kings and noblemen. Travelers to this land noticed the golden fruit and often mentioned it in their writings. Perhaps some of them carried fruit and seed to their own countries, thus beginning the world-wide spread of this fruit.

Some time later, after citrus fruit was being cultivated — no one is sure just when or how — citrus began its long, slow trek westward. Perhaps it was carried by traders on camel-back over the age-old caravan routes that wandered across Asia to Asia Minor, and so to Europe. Perhaps they were taken to India, and thence by wild Arab tribesmen to Arabia. At any rate, the citron — first member of the citrus family to reach the shores of the Mediterranean Sea — was mentioned by Theophrastus in 300 B.C. It had come to Persia from Media. How it arrived in Media is lost in the mists of time. It is interesting to note that Theophrastus said it was known as the Median-apple. A Median coin of the period of about one hundred thirty years before Christ showed a citron fruit on one side.

The sour or bitter orange and the lemon were the next citrus fruits to advance into Europe. These fruits probably spread through the Mediterranean area during the period between 500 and 1100 A.D. Both the Crusaders and the Mohammedans had a great deal to do with this spread. As the weary Crusaders returned home from the various crusades, they took citrus fruit and seeds along, and as the Arabs surged westward, they also carried citrus along.

It may have been the victorious followers of the Prophet who first brought the sweet orange into the Mediterranean area. The first authentic records of the citrus fruit from which our modern orange came go back to the eighth century A.D. At that time, both sweet and sour oranges flourished under the shadow of the Himalaya Mountains in the Valley of the Ganges. Toward the close of the ninth century, oranges were cultivated freely in Arabia, so they may have been brought back as spoils or tribute by returning Arab raiders.

When the Mohammedan armies, spreading their religion by the sword, fought their way into Spain, they no doubt brought the sour, or Sevilla, orange into Spain. These same fierce warriors introduced the lemon, citron, and pomelo into the country. The sweet orange did not appear on the scene in the Mediterranean area until later — probably as late as the fourteenth century or early in the fifteenth.

A young grove in the foreground, with an older grove in the background. Scientific research made possible the growing of citrus on thousands of acres originally thought unsuited for its production

There is some evidence that the first use of shelters like our modern greenhouses was to house citrus fruit. Apparently, in the fourteenth century, citrus fanciers began to use specially heated buildings, designed to produce an artificial climate for their citrons and oranges. Before this, in the early growing of citrus in Europe, frost injury caused much damage. The special shelters were called "orangeries," although many other exotic plants were grown in them.

Although the sweet orange did not appear on the scene in the Mediterranean region as early as other citrus fruits, and was probably grown only in the gardens and orangeries of the nobility and the rich in 1492, this fruit was widely cultivated in the early part of the sixteenth century. Citrus was ready for its next big jump westward at the time of the great explorations of the New World.

No less person than Christopher Columbus himself brought the first citrus seeds to America. On his second voyage, in 1493, Columbus brought seeds of the sour orange, lemon, and citron with him from Gomera, one of the Canary Islands, and planted them on the Island of Hispaniola, which is now Haiti - San Domingo. There they grew and multiplied, until in 1525 the naturalist Oriedo found so many "they were past counting." Sweet oranges were brought into the New World by later explorers and colonists.

The expedition headed by Juan de Grijalva brought the first citrus seed to the mainland of America. In 1518, Bernal Diaz del Castillo, a soldier in this expedition, sowed orange seed near an idol house in Central America, where he and several other men were sleeping to avoid mosquitoes. He did this, he said, because he had heard they were coming back to colonize. The priests tended these plants when

they came up, and the trees thrived.

The exact date when citrus was brought into what is now Florida is not known. Pedro Medendez, writing in St. Augustine in 1579, declared that citrus fruits were growing there abundantly at that time, so they probably were brought in and planted by the first settlers there in 1565.

Wherever the lusty Spanish settled in the Land of Sunshine, citrus plantings soon appeared. The Indians took some of this fruit with them in their wanderings about the peninsula, dropping the seeds as they went. Years later these resulting wild sour orange and rough lemon trees were found in the dense hammocks and heavily forested areas by early travelers and settlers. It is no wonder these early Floridians thought these exotic fruits were native to the country. Even some sweet orange trees became denizens of the wilds of early Florida.

Citrus trees are very long-lived. This old tree was probably older than 50 years when it was photographed. Citrus trees live to be well over 100 years.

Still the travels of the citrus family were far from ended. About the early part of the seventeenth century, Portuguese colonists brought the different citrus fruits into Brazil. By 1653 Bernabé Cobo reported that sweet and sour limes and lemons grew "to good size and also very juicy" in Peru. Oranges were also found there. By all reports, it seems clear that citrus was widespread in the Americas by the late sixteenth or the mid-seventeenth centuries.

Much earlier than this the orange, lemon, and citron had reached South Africa. Vasco de Gama, who visited Mombasa in 1498, was given citrons, lemons, and sweet oranges by the king of the country. The Mazoe lemon became wild there. It has been identified with the rough lemon of Florida, which became wild here.

The first orange trees were brought to the Island of St. Helena by the good ship "Tulp" in 1654. These were planted in the governor's own private garden. Other trees were brought from India, and by 1661 all the above species, as well as pomelo, were growing in the governor's garden. The orange trees first fruited in that year; the governor himself "plucked the fruit and pronounced them good."

The orange made another world-circling stride in 1788, when early settlers were carried to New South Wales in Australia by Captain Hunter. Hunter carried orange seed along on the voyage from Rio de Janeiro, Brazil, and planted them in the new country. Thus by the end of the eighteenth century, citrus had advanced westward across the vast expanses of Asia, to Africa and Europe, thence to the New World, and back across the wide Pacific to a point relatively close to its point of origin, taking many slow centuries for the trip.

Of the plantings of citrus in what is now the United States, those in Florida are by far the oldest. The next introduction of citrus into this country was made by Bartolomé Martinez in South Carolina. In a letter to the King in 1577, Martinez said, "I planted with my own hands grape vines, pomegranate trees, orange and fig trees . . ." at St. Elena (Ellis) Island. Citrus, in small plantings, has thus been grown for many years on the coast of South Carolina and Georgia, and on the islands off the coast.

Citrus was being grown in what is now Arizona before any settlements had been made in California. Father Eusebio Kino, a Spanish missionary, stated in describing the establishment of early missions in what is now Arizona that during the period between 1707 and 1710 many Castilian fruits were being grown, including oranges. Citrus in Arizona was limited to a few scattered plantings, however, until the twentieth century, when a few small commercial groves were planted.

Spanish missionaries also introduced citrus into California. These Spaniards tried planting many kinds of fruit and vegetables, not all of which were adapted. Clearly, however, oranges and lemons were among those that succeeded. They were being grown in mission gardens in Lower California before 1739. When the first mission was established at San Diego in 1769, citrus arrived in California proper. Father Thomas Sanchez planted the first orange grove in California at the San Gabriel Mission about 1804.

In other parts of the United States where citrus is now being grown, the industry has been established rather recently. Although some trees have been growing in most of the Gulf States for some time, it is mostly since the turn of the century that commercial groves of any size have been planted here.

In the 1880's small commercial plantings were made in Louisiana, and these have been increased until now there are more than one hundred fifty

A grove surrounding a small lake near Lake Placid, Florida. Such bodies of water and high sandy ridges help protect Florida citrus planting from cold. A Federal-State frost warning service keeps the growers posted on expected cold snaps so they can take measures to protect their groves.

thousand trees in that state. Commercial plantings in the Lower Rio Grande Valley were begun about 1910. These have now been extended until more than sixty thousand acres are now in citrus, two-thirds of it grapefruit. Texas has experienced a good bit of trouble from cold, and this factor has limited the spread of citrus in other Gulf States.

The birth of Florida's great citrus industry may be said to have taken place at a spot near what is now Safety Harbor, in Pinellas County, about 1809. In that year a Spanish nobleman, Don Phillippe, migrated to Florida, bringing with him citrus seed. Here the Don established what seems to have been the first cultivated grove in the United States. Earlier ones were not cultivated.

After Florida was ceded to the United States in 1821, Zephaniah Kingsley — sugar planter, slaver, author, patriot and alleged pirate — occupied Fort George Island at the mouth of the St. Johns River. Kingsley, in 1824, planted a three- or four-acre grove here, later known as the Mays grove at Orange Mills. About the same time he planted the Rembert grove on Drayton Island. For a long time these were known as the oldest groves in Florida. Both were sweet orange seedlings.

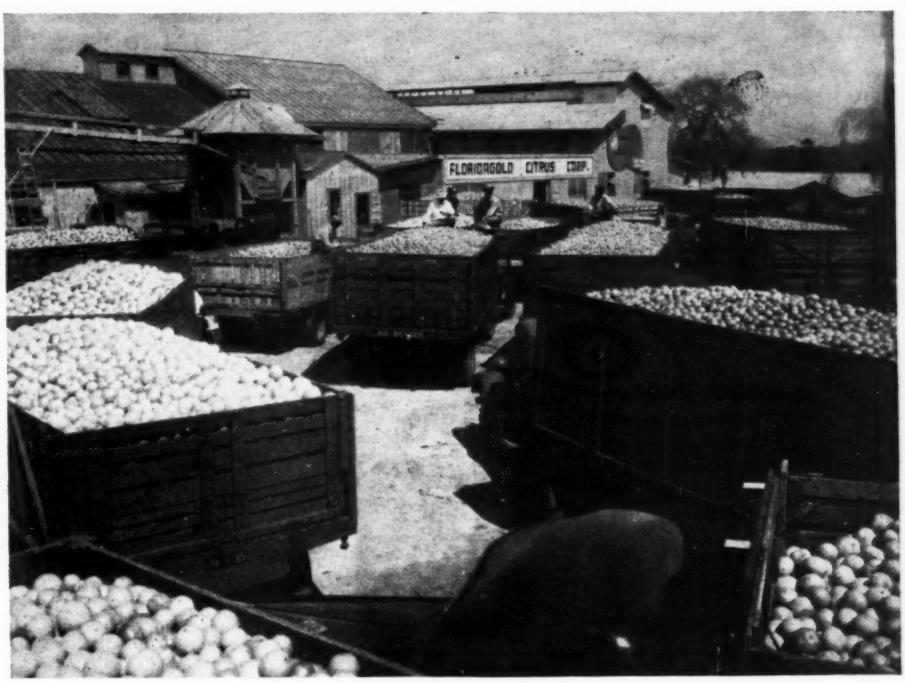
Another famous grove is the Dummitt grove on Merritt Island; it is known as the oldest budded grove. This was established by Captain D. D. Dummitt about 1830. The oldest trees of this grove were top-worked from wild sour orange stock at a height of three or four feet. Captain Dummitt brought the buds for this top-working from a wild sweet orange tree that was growing near New Symrna, Florida.

D. J. Brown, writing in 1875, tells us that before 1835 St. Augustine was a center of the early citrus industry. At that time the equivalent of fifteen hundred barrels of oranges were shipped from this port each year to Charleston, Baltimore, New York, Boston, and other towns.

But 1835 brought near disaster to the infant industry. This was the year of the first great freeze. Colonel Dancy, a well-known pioneer citrus grower, wrote this of the freeze, "Trees a hundred years old were killed to the ground. . . . In the spring, however, the trees grew up from the roots and in two years bore fruit once more." Later plantings were scattered along waterways and along the coast so that the fruit could be shipped easily by boat. At that time the value of bodies of water for cold protection was not considered.

So far we have made no mention of the grapefruit. This is understandable, because grapefruit probably had its origin in the New World, on the Island of Jamaica. In the early days a Captain Shaddock brought pomelos — which later became known as shaddocks — to the island, and they were widely grown there. The grapefruit probably developed as a sport of the shaddock, since a fruit known as the grapefruit was grown in Jamaica in 1814. Others think that the grapefruit

Processing citrus and citrus byproducts is now big business in Florida. Here truck loads of citrus from the groves await unloading at a processing plant.



may have resulted from a natural cross between the orange and the shaddock.

The Don Phillippe grove mentioned above was planted from grapefruit seed probably brought from this island. The Duncan grapefruit, an important variety today, originated from this grove as a seedling. As late as 1932, a tree reported to be one of the original trees in the Don Phillippe grove was still growing.

Many years passed before grapefruit were considered fit for human consumption. A few were shipped north between 1880 and 1885; but it was mostly grown in Florida for home use. Northern visitors who spent their vacations in this State ate grapefruit, and gradually a demand for it was created in the North. Now grapefruit is a large factor in world citrus production.

Florida citrus production had reached a commercial scale by 1870. In 1884-85 this State produced six hundred thousand boxes of citrus fruit. Next year this volume reached nine hundred thousand boxes. In 1886-87 the crop was one million two hundred sixty thousand boxes, and it continued to increase until 1895, when the crop had reached a volume of five million boxes. This was twice the volume produced by California in that year.

Then Nature dealt another crippling blow to the young citrus industry in Florida. The destructive freezes of 1894 and 1895 almost wiped out citrus in this State. Next year the crop was only one hundred fifty thousand boxes. To make matters worse, another severe freeze struck in 1899. The industry in the northern part of the State never recovered from these set-backs.

Citrus growing spread south in Florida in the first part of this century, with cold protection a primary consideration of the growers. Since this production was from young groves rather than old ones, it was 1909-10 before the Florida crop again exceeded five million boxes. By the end of the first World War, the crop surpassed ten million boxes. In connection with these figures, it is interesting to note that a Florida box is about 1.60 bushels, while a box in California is 1.48 bushels. By this time experimenters had found that citrus trees could be grown on rough lemon root-stock on the high, warm, sandy ridges of the State. Groves in such locations form the basis of the industry's size today.

Florida's production of citrus at the present time excels that of any other state or country in the world. During the 1935-40 period, Florida produced an average of seventeen percent of the world's supply of oranges, grapefruit, and tangerines. This production increased to twenty-eight percent average during the period from 1945 to 1950. In 1950-51 this State produced thirty percent of the world's supply of citrus, and in 1951-52, this percentage increased to thirty-four percent.

During the 1952-53 season, all citrus production areas in the United States produced forty-four percent of the world's crop other than lemons.

And so today, more than five thousand years and ten thousand miles from its oriental birthplace, citrus culture has reached its highest development in Florida. Florida's citrus production approximates the total combined production of all other major fruits in the United States, including apples, pears, and grapes.

Still the citrus industry continues to grow. Scientific research is continually finding new ways to produce more fruits on the existing acreage, and discovering new ways of utilizing the fruit produced. The development of the canning industry for citrus gave a needed big boost to citrus growing. Then the process of quick freezing made citrus juices available to all parts of the country at any season. Recently, the U.S.D.A. has announced a new process to produce an orange powder, which, when mixed with water, equals the flavor and nutrition of the original product. This powder could make it possible to ship citrus products all over the world, at any season, in small space, and without danger of spoilage.

Citrus byproducts have become big business, too. About sixty million boxes of citrus fruit were processed in Florida last year. The refuse from this processing amounted to more than two and a half million tons. From this mountain of refuse, scientists have found it possible to produce more than thirty-eight different kinds of useful products. These include citrus pulp and citrus molasses for cattle feed, oils, dyes, synthetic blood plasma, and vitamin P.

NEUROSPORA (from page 142)

by dozens of workers, so that neurosporology has come to be a sort of special subdivision of biological science. And evidence provided by Dr. Dodge and *Neurospora* proved crucial in one of the most dramatic of recent scientific discussions.

Because of their failure to apply in advance for a place on the program, a group of Russian biologists who showed up for the International Botanical Congress at Stockholm had to be assigned a special meeting for the papers on genetics that they wished to present. Because of the peculiarities of Soviet genetics, which its proponents have proclaimed as different from and superior to the "bourgeois genetics" studied and taught by most of the world, a large and expectant audience was at hand to hear the exposition and defense of their biological dogma. This involves the "directed education of the organisms" — which means that it is held possible, by growing a plant under conditions demanding a certain change in its constitution, to force the production of that change and its transmission to later generations. The issue was and is inheritance of characters acquired as an adaptive response to environmental influence versus inheritance of characters resulting from protoplasmic changes having nothing to do with the nature of the environment. The discussion was difficult because of the evident reluctance of the head of the Russian delegation to answer questions from the floor. But questions finally were permitted and some answers attempted; and the meeting ultimately came to be focused on the validity of genetic ratios. The Soviet speaker stated that the 1:1, 3:1, and 1:2:1 ratios and all the rest were only statistical approximations, not reports of observed phenomena. Thereupon his attention was called to the results of the *Neurospora* work, where the products of reduction division and of crosses are exactly, not approximately, and directly, not inferentially, known. "If you deny the hereditary function of the chromosomes," he was asked, "how do you propose to interpret these facts?" His best answer was that he would answer that question the next day; but he didn't, and hasn't. Dr. Dodge's *Neurospora* held the answer to that problem, too.

Fruits of *Strophanthus sarmentosus*

By Joseph Monachino

Not a single complete strophanthus fruit was available at The New York Botanical Garden before studies in the genus were initiated. Recently, about sixty mericarps of the species *S. sarmentosus* alone were sent by Professor T. Reichstein, Basel, Switzerland, to show variation in structure and size and possible correlation between chemical properties and morphology. This is probably a greater number of fruits of the species than the total deposited in all combined herbaria, before commercial interest in the plant began late in 1949. Many other fruits of *S. sarmentosus,* besides those mentioned above, and also fruits of other species, have been received regularly since 1950.

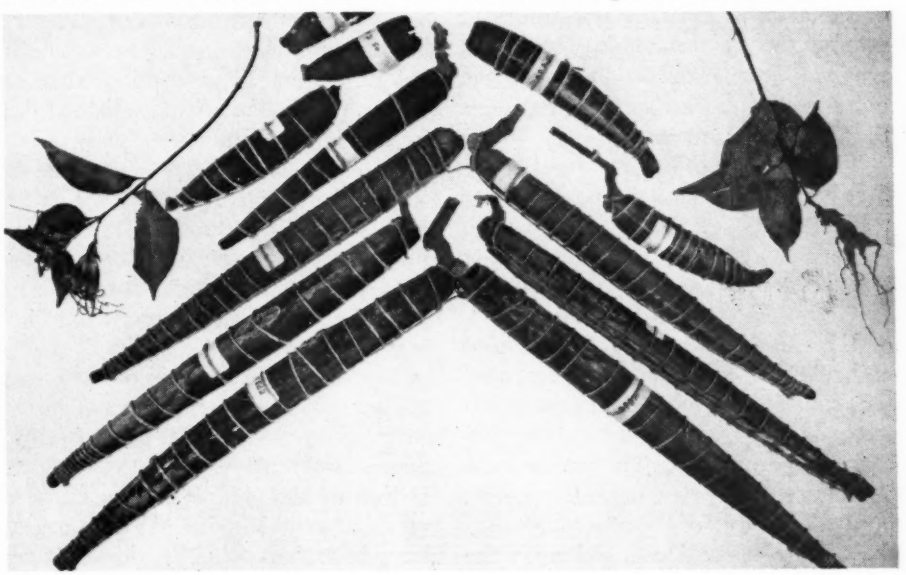
The mericarps of *S. sarmentosus* vary greatly. They are 5 to 28 centimeters long, slender or broad, tapering at the apex or short and blunt, smooth surfaced or densely and strongly lenticelled. They may weigh up to 88 grams and contain about 9 grams of seeds each. A complete dried fruit weighing 345 grams has been reported from the Gold Coast. The walls of the pericarp vary in thickness from 2 to 11 millimeters.

The chemical variety yielding sarmentocymarin grows in the northern savanna areas of Africa, from the Atlantic to Lake Chad, in Senegal, Sierra Leone (?), Sudan, and Nigeria. The southern limit is roughly 13° latitude north of the equator. Other forms of the species yielding only traces of sarmentogenin, if any, extend south to Angola and across the continent to Uganda and Tanganyika. The fruits of the sarmentogeniferous variety are comparatively slender and thin walled. Seeds of the best strains — yielding up to about one percent sarmentocymarin — have been distributed through The New York Botanical Garden for plantation trial in Florida, Louisiana, California, Puerto Rico, Cuba, Costa Rica, Peru, Hawaii, and Java. Trials are being made in dry and wet grounds, low and high altitudes, shade and sun, and in many other different situations, so that reports should yield ample data on the tolerance of the species. In addition, seeds for histological and paper-chromatographic studies have been sent to Heber W. Youngken, Alexander Nelson, and David A. H. Taylor; for experimental work to M. J. Dijkman and the Boyce Thompson Institute for Plant Research.

The ecological and microclimatic setting of the sarmentogeniferous variety of *S. sarmentosus* in the region of Kita was investigated by Paul Jaeger in 1951. He found it particularly fond of arid places, although tolerant of hygrophile conditions, forest galleries, margins of rivulets, humid shady ravines. According to reports by collectors, the species is distributed in laterite or granite, never in lime soils; it seems to need an average temperature of 20° to 40° centigrade. It requires dry weather and prefers full sunshine during fruit ripening. The variety is reported growing in sandy or stony soil or between rocks; as a climber if there is a support, otherwise as a shrub three to four meters in diameter. The roots are said to be very long. Wild plants of MPD 50 produced up to one hundred fruits or more each in their natural habitat. Plants cultivated from seed flowered two years after sowing.

S. sarmentosus is almost sure to prosper in the West Indies and Florida, where various strains have now been introduced in adequate numbers. Prospects are not too promising in Louisiana and California. *S. sarmentosus* seeds germinate easily and equally well in acid and lime soils, according to experiments conducted at the Boyce Thompson Institute for Plant Research. The seedlings grow rapidly with little care. From previous experience (with unselected strains) it is known that flowers are borne profusely. Techniques for commercial propagation are simple. Softwood cuttings root with comparative ease. The difficulty, and it is a serious difficulty, with cultivated strophanthus is fruit setting. Fruits are scarce in cultivated plants. This problem is being investigated by Dr. Dijkman.

Advances are being made in all phases of the strophanthus project. The seed chemistry is being investigated thoroughly. The seed histology is under study. The seeds of the forest and savanna varieties of *S. sarmentosus,* not clearly separable by botanical or anatomical means, can be distinguished by paper-chromatography, as the technique has now been developed. Plantation trials are being conducted in both Africa and Asia, as well as in the New World. The biology of the plant is being studied, although not to the degree it deserves. Rare species are being collected and their taxonomy elaborated. Directly or indirectly, The New York Botanical Garden has and is contributing to all these studies.



***Strophanthus sarmentosus*, MPD 50, collected in 1950, near Dakar, Senegal, French West Africa. Fruits show variation in length of the mericarps. At the top is seen a complete fruit consisting of two divergent mericarps. Seeds of this strain or variety of the species yielded sarmentogenin, a compound from which cortisone can be synthesized. The fruits are tied with strings in order to keep them from opening and casting their seeds.**

TAMING WILD GRASS

By **Sarah R. Riedman**

How old is grass? Can we trace its family tree? Was there a time when there was no grass in the world? Was the grass family, millions of years ago, like its relatives that we see growing today? Scientists know some of the answers to these questions, but not all.

The horse you and I see in the pasture in no way resembles his great, great-grandfather. This ancestor lived about fifty-five million years ago. There were not only no calendars in those days — there were no people, either.

If you saw a picture of the great, great-grandfather of our horse, you would say he looked more like a small fox. We don't have any real pictures of this ancestor of the horse; but his remains in the rocks of our Western States tell us something of his size, the number of his toes, and his kind of teeth. Footprints left long ago in soft clay that has become hard rock makes a kind of calendar because we know how old the rock is.

This ancient horse had teeth for eating twigs and bark. His head was much smaller; it held fewer and smaller teeth, with small sharp points or cropping cusps, something to get at twigs. By the fossil calendar we can tell also that there was no grass when the little browsing horse lived.

This rock calendar tells us that the first grasses appeared about twenty million years ago. The little browsing horse changed his diet. He now ate grass. He became a grazing horse. What's more, over many, many generations, he grew into a different kind of horse. He grew big; his feet and toes changed so that he ran faster. His teeth changed most of all. They became large and flat. They were now grinding grass. Not only the horse, but the ancestors of the other farm animals grew up and changed with the growth and spread of the grass family. These animals also lived on grass.

Grass was important to man. According to the fossil calendar man developed sometime between one and ten million years ago (we do not know exactly when). The earliest people we know about were hunters. They lived on what animals they could find roving on the prairie lands. They learned also to gather the seeds of wild grasses. For thousands of years, while the men hunted, the women and children gathered seeds, crushed them between two stones, and made cakes from the flour. People still did not know how to grow food; they were still food-gatherers. When the supply was used up, they moved to new places to find new hunting grounds.

Animals also went in search of food — grasslands. The earliest people of our own continent probably followed the herds of bison, the relatives of the ox, moose, deer, horse, wolf, and bear. Scientists believe that possibly that is the way people first came from Asia to America, through Alaska. The grass cover of the Alaskan Peninsula is today lush fodder for grazing animals. The grass-eating animals went in search of grass, and man followed in search of animals and of grass.

Food was not always easy to find. People had to learn ways of getting it. After many more generations people changed from hunters and food-gatherers to food-growers. They learned to tame the wild beasts, first to help in the hunt, then to give food and to do work. The tamed or domesticated dog helped in the hunt; the cows, sheep, and goats made good food, and the ox did the hard work. To tame the cattle, man had to give them food, and to give them food he needed grassland for fodder. For himself and his cattle he needed to tame the grass, also. That was the beginning of cultivation.

The imprint of a grain of oat on an ancient pot reveals that people raised oats. An ear of corn worked into an urn is a clue showing that the Aztec Indian cultivated corn thousands of years ago in Mexico. Wheat grains have been found in the oldest graves in the world, in the valley of the Nile River. All this happened long before history books came to be written. The cultivation of grain and the breeding of cattle were already being carried on far more than five thousand years ago. About that time people began to record history, although not in books. The archaeologist has other clues to the past, which he patiently follows.

In learning to grow wheat, corn, and oats, these ancient farmers developed their science of agriculture. Who knows how many thousands of years and what back-breaking toil it took to learn what every farmer's boy takes for granted today?

Nearly all of the cereal grasses once grew wild. Long before they learned to sow them, people must have discovered that some seeds were good to eat. Wild oats, wild wheat, wild Indian rice, and a kind of millet must have grown without cultivation. We know this because even after people learned to plant they still sometimes ate seeds of wild grasses. Stories are told about manna grass, where a slight shake of its seed head loosens the grain in showers. To gather its seeds one has to wade in water where it grows and skim off in a basket or a hat the loosened grain floating among the patches of grass.

Wild oats were used as food in Sweden as recently as one hundred and fifty years ago. This may seem like a long time ago, as even your grandfather was not yet alive then, but it is not so long ago in the history of cultivation and in the story of mankind as a whole. Until about one hundred years ago, the seeds of wild millet were gathered in Europe and in Africa; in America, too, wild rice or wild oats were gathered as food. The seeds were shaken loose and swept up into a straw basket.

It is possible that at first people learned to cultivate plants by accident. We don't really know, but we can guess that some seeds were accidentally dropped on the ground and sprouted on the spot where they were lost. People must have noticed that where one seed had been dropped into

the soil, many new grains now grew. That gave them the idea of scattering seeds to make more grow. They had to dig up the soil and bury the grain. This wasn't easy, because they didn't have plows. They used sharp-edged stones as hoes, and covered the grain with the upturned soil. In the autumn they reaped the harvest.

The idea of planting the seeds in the spring and reaping a harvest in the fall seems easy enough for us to understand today. But it was a great mystery to people many thousands of years ago. They thought they were burying seeds, not *planting* them. Then when they grew as new plants, people thought the seeds were in some mysterious way reborn. They believed that their gods had brought about this miracle.

The name of our breakfast foods — cereals — is taken from Ceres. Ceres was the goddess of grain and harvests. Her beautiful daughter, Proserpina, was the goddess of the spring. One day Proserpina was snatched away by Pluto, the god of Hades (the lower regions). When Ceres missed her child, she was most unhappy and searched all over the earth for her, but without success. In her great sorrow she neglected her duties of looking after the crops. The crops withered and died, and there was famine in the land. But the goddess of harvests would not restore the fruitfulness of the fields until her daughter was returned. Jupiter, the father of the gods, promised her that if Proserpina would not take food or drink while she was in Pluto's palace in the underworld, she would be free again. She did not taste a bit of food or drink until the day of her release came. In her joy at leaving, she ate six seeds of a pomegranate. She returned to her mother, Ceres, but because she had broken her vow not to eat, she had to return to Hades six months of every year. Proserpina, the goddess of spring, disappears when the summer is over. Her mother, Ceres, lonely for her daughter, neglects her job of caring for the crops. There is winter upon all the earth until Proserpina returns next spring.

This was the way one ancient people explained the appearance and disappearance of crops with the seasons. Ceres was the name given by the Greeks to this goddess. The Egyptian people called their goddess Isis. Isis taught agriculture and the arts to man. She was the daughter of Geb (the earth) and Nut (the sky). Isis represented plenty of food and large families. The Scandinavian people had still another god of agriculture, Frey. He was the god of rain and sunshine, and made all the things of the earth grow.

People believed that the gods sometimes became angry, and this made the crops fail. At other times they made the harvest a plentiful one. Every spring the people held ceremonies to urge the gods to give them a crop of plenty, and in the autumn to sing their praises for a good harvest. At the harvest festivals they played games, singing and dancing around the ears of grain. Even though people today know how the seed grows into the young plant, and realize that the ancient gods did not really exist, the gay festivals at harvest time still form part of the customs of many people. The American Indians and the Mexican Indians celebrate the harvest with joyous ceremonies lasting many days. The grown-ups and the children, in gay costumes, dance and sing and join in games.

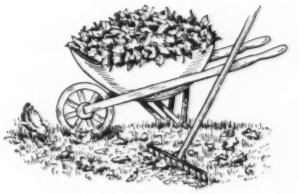
Primitive man was a hunter before he was a cattle-breeder; a grain-gatherer before he became a grain-producer, the wild grasslands furnishing forage for his cattle and seeds of wild grass as part of his own food. He had to wander in search of new and fresh pastures, a herdsman seeking new grazing lands. Whenever he learned to tame the grasses as well as the cow, the ox, the sheep, and the goat, he could settle down in one place. He could build a home and, with his neighbors, build even a village.

Taming wild grain couldn't have been easy. It did not always do so well as its uncultivated cousin. Wild prairie grass had made itself a secure home in the plains. It pushed its many roots deep into the ground. It did not have to be planted. Nor did it need care. It was a very tough plant. It was used to dryness and did not die of cold or heat. It made good fodder for sheep, goats, and cows. But its toughness was sometimes a mixed blessing. It spread and spread, crowding out grain, a much weaker plant. Its roots had a firm grip on the soil. They could not be pulled up by the hand, and the stone plow could barely scratch the top of the soil. Besides, grain planted so close to the surface was easily washed away by rain, eaten by birds, or dried by the hot sun. When it did take root, it had to share its water with a stronger neighbor, prairie grass. Prairie grass was probably the first weed, among the cultivated wheat plants, just getting a start in life.

The harvest was most disappointing. You could hardly find the small, empty seed heads. This meant no bread for the winter. The wild prairie grass had taken over the fields. Plenty of grass for the sheep, cows, and goats to graze on! It seemed a lot easier to watch over the grazing herds on the prairie. No tools were needed for this work. One fed the animals and got their milk and meat. But the life of the herdsman was not always so easy, either. As the flocks grew in number, even the vast and spreading grasslands were not enough to feed them. The flocks of many herdsmen together overgrazed the land. The grass became skimpy or bitten down to the roots. Long periods of dry weather cut down the growth. The different tribes began to war with each other. But warfare did not make more food. The search for new grasslands brought on more wars.

Much later in history, when people began to trade with each other they carried their goods on the backs of horses and camels. Since they could not carry the food for the animals, the trade routes had to be along grasslands. Wars were sometimes started over these grasslands, just as wars at other times were fought over sea routes.

(To be continued)



BOOK REVIEWS

THE YEARS IN MY HERB GARDEN. Helen M. Fox. 185 pages, illustrated, indexed. Macmillan, New York. 1953. $3.95.

The list of Mrs. Fox's books grows steadily longer; but while all are of importance to gardeners and herbalists, giving needful background facts, botanical names, and good advice from wide experience, this book could only have been written by one who has lived with herbs and loved them, and learned their individual personalities and the very turn of their heads.

These years have been filled with journeys and searching for rare plants and romantic episodes as well as strenuous gardening. When Mrs. Fox brought her treasures home and settled them in, she kept careful notes of every plant and its growing habits. In all the masses of green, each plant is her friend individually. How many of us would think to put a certain variety of oreganum on a bank "where the bending of the stems is suitable to the slope of the land"?

There are many ways of looking at an herb garden: as a department of horticulture, as a stimulus to good eating, and as a place to breathe in fragrance and health. Mrs. Fox adds to these the work of beauty, in her understanding of subtle and understated color, contrasts in foliage, and the love of design and texture, when she does such things as mixing seed of several flowering herbs "in a cup before it is sown to produce the effect of a flowery tapestry or brocade." We feel that she can coax more out of her material than most of us can.

Added to helpful hints from her own experience in the two lovely gardens so intimately a part of her life, there is a chapter on garden design and a list of trees and shrubs suitable to the herbal setting. An account of the work now being done with herbs for the blind, and for the mental and physical healing of war veterans is very timely. "What the herb garden means to me" is the title of a chapter which draws a response from all of us who have planted herbs. In its attractive green jacket and arrangement of material the book is the gardener's friend, but also very readable even without a garden at all.

MARTHA GENUNG STEARNS
Editor, "The Herbarist"

FLOWERS OF THE SOUTH. Wilhelmina F. Greene and Hugo L. Blomquist. 208 pages, illustrated, indexed. University of North Carolina Press, Chapel Hill, N. C. 1953. $5.

Since books about southern flora are all too few, and those divulging accurate information rarer still, any book at all on this subject is approached with sympathetic eagerness, and one so charmingly and fully illustrated as FLOWERS OF THE SOUTH is opened with delight. I always judge books by their ability to answer the questions I ask of them. Having just returned from a trip to the coast, I asked this book the name of the graceful pink flower that blooms all summer in the savannahs and sways in the wind. Is it rhexia? Turning to the index I find that rhexia is there (and if I had looked for meadow-beauty or deer-grass, I would have found it just the same) and referring to the proper page, I find a drawing clear enough to answer my question. It *is* rhexia.

Earlier in the spring an English artist here on a visit had asked me the name of a low, white-flowered shrub that she saw in bloom between Brunswick and Atlanta. I could not tell her, and by the time I had the answer from Dr. Totten, she had gone on her way to England. If I had had FLOWERS OF THE SOUTH at hand, she would have been able to identify her three-petalled blossom at once as a southern species of paw-paw.

If the purpose of the book is easy identification of a large number of the plants, both rare and familiar, of southern fields and woods and gardens, I should say that the purpose is fulfilled. It is, however, more of a book for Florida and the Gulf states than for the South in general. To me this does not make it less interesting or valuable, only I think the title is a little misleading.

Nevertheless much of the material is of value to gardeners in the Middle South. I am always glad to see attention called to such beautiful natives as *Illicium floridanum, Stewartia malachodendron, Gordonia lasianthus, Hypericum frondosum, Cyrilla racemiflora, Pinkneya pubens, Befaria racemosa, Batodendron arboria* and *Zenobia pulverulenta* — all such ornaments to gardens, and all so seldom seen in them. Some of the tropical and subtropical plants will grow farther north than the authors think — farther than most gardeners think. *Callistemon rigidis* has survived a winter in Charlotte, although a mild one, and bloomed in the spring. *Duranta repens* grew and bloomed and berried for several years in my Raleigh garden, before I had the unfortunate desire to dig it up and put it in another place. Daubentonia, chilopsis, and *Poinciana Gilliesii* are all flourishing in Charlotte. The poinciana sometimes gets killed in Raleigh, but as it grows so quickly it is easily replaced. I find gloriosa growing and blooming in Charlotte gardens without being taken up in the fall, and *Hedychium coronarium* is hardy in Virginia.

I am glad to meet again some old friends pictured in Caroline Dormon's beautiful book, WILD FLOWERS OF LOUISIANA, from which I learned the garden value of such lovely things as *Crinum americanum,* kosteletskya, nemastylus, and herbertia.

One thing bothers me. I wish they wouldn't do their zoning in the direction opposite to the customary system. I am used to having the tip of Florida number nine, and it confuses me to find it number one.

ELIZABETH LAWRENCE
Charlotte, North Carolina

GARDENS AND GARDENING. Vol. 3. Hardy Plants. F. A. Mercer and Roy Hay. 142 pages, illustrated, indexed. Studio Publications, New York. 1952. $5.

This volume, edited by Frank A. Mercer and Roy Hay, deals mainly with the hardy herbaceous plants such as are employed for garden decoration, their culture and uses. Some nine specialists in their various fields, together with Mr. Hay, do an excellent job on their respective topics.

Brenda Colvin discusses in a very readable manner fundamentals of that most important point of garden making, the relationship of plants to their setting and one another; not the individual beauty of a particular flower but of the whole plant and the part it plays in the overall composition. Texture of foliage, the play of light and shade, structural design, and pattern are all treated together with selection of site. A number of excellent photographs illustrating the various points stressed are included.

N. Leslie Cave discusses the tall bearded iris, their traits, temperaments, and culture, as also diseases to be controlled. Lists of varieties are provided and also a plea not to forget some of the other equally beautiful species.

The case for the delphinium is championed by Allan G. Langdon. His chapter is full of sound advice on culture, care, and planting effects. The illustrations of named sorts, groups of sterling varieties, beauty of form of flower and structure make one envious of the ease with which this majestic plant thrives in the British Isles. That most useful of the delphiniums, the belladonnas, is given special notice.

The adaptability of hardy flowers is treated by Mr. Hay who, in his recital of a long list of subjects, considers them from a decorative point of view both as a plant and for cutting. He breaks down this list into interesting sub-headings, plants to leave undisturbed, carpeting plants, plants that require no staking. Mr. Hay even suggests planting thickly so that each plant supports the other.

The chapter on paeonies is in good hands, being written by James Kelway. Varieties of the different types and species are listed as to color, time of flowering, and other points such as fragrance and growth characteristics.

Herbaceous plants for edging borders and beds is the work of James Comber, an authority and well-known cultivator of hardy plants. His is a very complete and informative section on the selection of edging material for many sites —beds, borders, walks, formal and informal, dry walls, slopes, shrubbery and water.

Border carnations and pinks, hardy asters, and ferns each have a chapter done by experts in their respective subjects.

This excellent book covers the subject matter well; illustrations are profuse, the photography pictorially and technically excellent and well reproduced.

EDWIN BECKETT
Berkshire Garden Center

AZALEAS AND CAMELLIAS. H. Harold Hume. 93 pages, illustrated, indexed. Macmillan, New York. Revised edition 1953. $2.50.

Today, when we see, not only in the South, but in all parts of the United States where favorable conditions exist, from the Atlantic to the Pacific, an azalea and camellia conscious public, eager and anxious to learn how and when to plant them, the different varieties, propagation, proper soil, cultivation, care, feeding, etc., I can only say — do not delay in getting into your hands at once Dr. H. Harold Hume's revised edition of AZALEAS AND CAMELLIAS.

Every step is so clearly and simply outlined that the beginner and the seasoned expert planter of azaleas and camellias will find valuable information and suggestions.

Through the years we have planted azaleas and camellias in our gardens at Sea Breeze Farm, and today have been rewarded with hundreds of camellias, some about thirty feet tall, cuttings and seedlings which have bloomed, and are even lovelier than

their parents. Azaleas of all hues, and of large size, border our driveways — and are trying to overrun them.

Dr. Hume is a wonderful horticulturist and has been a blessing to all flower growers. He is an inspiring educator to me personally, in all my garden activities and undertakings.

The revised edition of AZALEAS AND CAMELLIAS is an "Open Sesame" to all azalea and camellia lovers and growers.

EVELYN COLLINS HILL
Lynnhaven, Virginia

GLOXINIAS — AND HOW TO GROW THEM. Peggie Schulz. 128 pages, illustrated by Phyllis Krueger Moe; indexed. M. Barrows, New York. 1953. $2.95.

In this first book on gloxinias for the indoor gardener, Mrs. Schulz has skillfully brought together a fund of valuable information on the culture of gloxinia species and hybrids as well as related gesneriads.

Step-by-step instructions for sowing seed, starting tubers, resting plants, hybridizing, methods of propagation, and treatment of ailments are all clearly explained for both the gardeners who have but a single plant window and those with the more spacious accommodations of a greenhouse. Many how-to drawings help illustrate the all-important cultural points, and four lovely full-color illustrations and several black and white photographs of specimen gloxinias serve to spur the reader on to greater achievement in gloxinia growing.

Mrs. Schultz is co-editor of "The Gloxinian," official publication of the American Gloxinia Society, and a valued friend of numerous home gardeners who have come to know her through her enthusiastic and informative articles in leading garden publications based on her own vast indoor gardening experience.

RUTH MARIE PETERS
Managing Editor
Flower Grower

ANNUALS FOR EVERY GARDEN. Dorothy H. Jenkins. 223 pages, illustrated, indexed. M. Barrows, New York. Third printing 1953. $3.

The preface: "Whether it is the gardener new at his hobby or an expert with years of tilling the soil behind him, here is a book to help in the selection of annual flowers, in where to plant them and in how to grow them."

Miss Jenkins has lived up to the preface by writing a delightful, easy to read book that all gardeners will enjoy and find helpful. She deals with all phases of gardening from the seed right through to the mature plant and its use in the garden and in the home.

The quick reference charts on color, height, uses, growing space and time to plant are a boon to the busy gardener.

As garden editor of the *New York Times* and an ardent gardener, Miss Jenkins is well qualified to make this excellent addition to the garden book shelf.

MARJORIE PFISTER
Whitehouse Station, N. J.

FLOWER ARRANGEMENTS JUDGED AND POINT SCORED. Marie Stevens Wood. 166 pages, illustrations, bibliography. Merriewoode Press, Macon, Ga. 1952. $3.50.

Locked between the covers of Marie Stevens Wood's book is a new approach to the subject for the student arranger, the advanced arranger, and the judge.

There are upwards of sixty photographs in this book, thirty-two of which are arrangements by the author, that are judged, point scored, and commented upon by fourteen of America's outstanding flower show judges and designers. This, plus her chapter on point scoring, should be of interest and definite assistance in preparation for floral compositions in competition and for personal evaluation of all arrangements.

I feel, however, it is rare that a judge point scores as high as these arrangements are scored; I should also like to see more detailed criticisms. Despite this, I believe this new approach is one of importance in that it brings about a better understanding of the judge/competitor relationship.

A biographical sketch of each of the judges adds a welcome note and tends to bring the reader closer to the judges.

In a comprehensive manner, the author has set forth the requisites of design, the importance of achieving distinction and harmony in arrangements. Ably she presents a chapter on church arrangements, short but full of sound advice.

As an accredited judge and an exhibitor, I recommend a careful study of the author's chapter on "To Judge or not to Judge" as a helpful treatise of the problems of both judge and competitor.

This book is one for your library.

MARGARET D. GRUMBINE
Jersey City, N. J.

BETTER FLOWER ARRANGEMENTS FOR HOME AND EXHIBITION. Elizabeth Bear. 120 pages, illustrated, indexed. Grosset & Dunlap, New York. 1953. $1.50.

This is a very useful book on flower arranging, organized in an informal and readable style. The divisions of the book are: (1) The essentials of the art; (2) Arrangements for everyday living; (3) Blue ribbon arrangements.

Under the first section Mrs. Bear discusses home arrangements, basic terminology, types of containers, mechanics and conditioning, the possibilities of various materials, and illustrates her points with clear and simple sketches and with photographs of satisfactory arrangements.

In the second part she describes arrangements for special times and places, for holidays and other festive occasions. She emphasizes the use of dried material and suggests that a continuing search for interesting specimens can be very rewarding.

An especially helpful chapter classifies the various types of arrangements such as still life, contemporary, miniature, line, mass and others, and in a concise manner describes the characteristics of each.

The last portion of the book, although dealing with the subject of successful competitive compositions, is, nevertheless written and illustrated for the use of beginners as well as more experienced arrangers. Here again Mrs. Bear separates her subject, this time into historical periods, and indicates by word and picture their typical features.

A recent trend of arranging has included certain larger accessories in an intimate relationship to the plant material, with the flowers themselves supported by holders in unseen tin cans. Mrs. Bear has omitted any mention of this method. This and other possible omissions may be the result of her admirable desire to keep the book concise. Perhaps a sequel will be forthcoming to fill in the gaps.

CAROLYN S. HIRSCH
Briarcliff Manor, N. Y.

FLOWER PAINTING. Margaret Fairbanks Marcus. 24 pages, ten color plates; black and white illustrations. Harry N. Abrams, New York. 1953. $1.50.

Artists, students, and people prideful of their libraries are indebted to Margaret Fairbanks Marcus (text) and Harry N. Abrams (publisher) for the taste and coherence brought to the presentation of FLOWER PAINTING (portfolio edition).

It is not a textbook, strictly speaking, though it contains competent, brief analyses of the reproductions, flower painting historical notes, and biographical chit-chat about the artists whose works are reproduced, each of whom ". . . in his own way was forging the style of the future." Even the names, Redon, Manet, Cêzanne, Utrillo, Gaugin, Renoir, Degas, Monet, Van Gogh, only partially suggest the taste in selection and the quality of the text format and reproductions. Redon's exotic "Vase with Flowers," Renoir's magnificently flavored grays in "A Large Vase of Flowers," and Cêzanne's "The Blue Vase" might be the pages turned to most often.

The layman will pronounce this book beautiful. The artist-craftsman will call it "good," an ambiguous word to be sure but, in the craft sense, meaning universally acceptable. The reviewer's opinion of this book might best be indicated by the fact that a check for his copy is in the mail.

EDGAR A. WHITNEY
Jackson Heights, L. I.

NATURE'S MESSAGES. Sam Campbell. 221 pages. illustrated. Rand McNally, Chicago, Ill. 1952. $3.50.

Not everyone is blessed with the seeing eye and the understanding heart to interpret what Nature has to say, but Sam Campbell is one who has both to the Nth degree, added to the gift of being able to put into words that sing, the lessons she has taught him. The chapter on birds alone enriched the day for me, and his delight in the voices of the rain and the running brook seemed to bring back some of the raptures of my childhood when I, too, roamed the silent places and drank in the joys of exploration.

He knows that spring is in the heart, not in the season or the landscape, that spring comes, but summer never bothers to come or go, it is just suddenly here or gone. He knows that some clouds are easier to love than others, and that a lake is only a river waiting to go somewhere.

There is a world of riches between the covers of this charming book.

LOUISE D. HOLTON
Essex Fells, N. J.

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GEOGRAPHY OF LIVING THINGS. M. S. Anderson. 202 pages, illustrated, indexed. Philosophical Library, New York. 1952. (Printed in Great Britain.) $2.75.

M. S. Anderson in his book, GEOGRAPHY OF LIVING THINGS, despite the fact that the book is one of those "series books" which I detest particularly, has given us a challenge which cannot be pushed aside lightly. "Biography," the author states in explaining what the book is about "is the study of the biological relation between man * * * and the whole of his animate and inanimate environment." And further on, "These relations are governed by biological laws * * * as inflexible as those of the physical universe. . . . "

Good! Which is the same thing as saying that we as humans are as much a part of the biological world around us as are the simplest plant and insect, and we are going to pay a severe penalty every time we ignore or refuse to abide by these natural laws. It is as simple as all that. I heartily agree with the author: "We have devoted too much of our time and thought to the science of living in comfort — *and too little to the art of living well.*

The author then treats of his subject topic by topic, each chapter devoted to one of these major topics. Should time and space permit, a thrilling and constructive review could be written on each chapter. The chapter dealing with man and his relation to the rocks of the earth will be a joy to rock lovers. Few stop to realize that the lifeless stone is as indispensable to organic life as are air and water, yet such is the case.

I offer here a few quotes taken from the book at random. These, I believe, will reveal the worthwhileness of the book as a whole. From the chapter, Man And His Food: "There seems no escape from the conclusion that the ever-increasing pressure of population on the available land of the world, resulting from the uncontrolled increase in the numbers of men on earth, will drive us steadily to a more and more vegetarian diet until perhaps famine will overtake us and reduce our overgrown population." The author should have added but didn't: unless man cooperates constructively with Nature in the production of his food far more closely than he is now doing. And from The Problem of Famine: "Local famines are a symptom of poor adjustment of man's numbers and way of life to his local environment." Again the necessity of cooperating with Nature.

I recommend for special study the two chapters which deal with soil and its place in our existence. Not that the author has presented anything new; just that here are concentrated volumes of information that our mechanical civilization should consider *very* seriously, yet which it is inclined to shun because of the unpleasant forebodings it may give rise to. But the ancient axiom still holds whether we wish it or not: "As is the soil of the earth, so is man." This truth is being tragically revealed all about us because of land-neglect or poor land-management. Deserts are much nearer our doorsteps than most of us realize.

One cannot help wishing that Mr. Anderson had put a bit more drama into his writing; and written more for the non-reading man in the street, or the busy housewife. They are the ones who need especially to stop, look, and listen. The would-be learned ones for whom the book has apparently been written, are, as a rule, too concerned with the superficials of life to be bothered with warnings. However, if the book could be made required reading for every Boy Scout and every 4H boy and girl in the country, much lasting good might in that manner be accomplished.

JOSEPH A. COCANNOUER
Wilburton, Oklahoma

THE WONDERFUL WORLD OF INSECTS. Albro Gaul. 290 pages, illustrated, indexed. Rinehart, New York. 1953. $4.

The appearance of THE WONDERFUL WORLD OF INSECTS sets, I believe, two new records. It is the first volume to appear using the new Photon method of printing, which does away with all metal type and is, therefore, a pioneer project in the printing industry. Secondly, it is the nearest approach this reviewer has seen to the scientifically-sound insect book written for popular understanding.

This story of the insects reads as easily as any novel, yet the author is cautious not to make the book a recital of startling insect curiosities nor to indulge in that horror of good scientists, the broad unqualified pronouncement. He has condensed the major areas of our present knowledge of insects without being over-technical or stuffy and advances into our latest investigations, applications, and suspicions with the fresh enthusiasm of the curious explorer. Classification, that iron curtain for so many beginners, is touched lightly, the emphasis throughout being on the live insect, its growth and activities and its relationships, physical and economical, to the reader. Many of the myths concerning insects are laid low, but these are replaced with even more amazing and demonstrable truths that will send the average reader scurrying, with can or net, to his own backyard to verify for himself. The book is fully illustrated with remarkable full-page photographs that keep pace visually with the text and greatly enhance the reader's understanding as he follows the story.

The format of the volume is unusual and functional. In view of the undoubtable use of this book for home and library reference, it deserves a more substantial binding.

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State Univ. Teachers College
Geneseo, New York

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MEDICAL MYCOLOGY. G. C. Ainsworth. 105 pages, illustrated, indexed. Pitman Publishing Co., New York. (Printed in Great Britain.) 1952. $2.75.

ATLAS OF MEDICAL MYCOLOGY. Emma Sadler Moss and Albert Louis McQuown. 245 pages, illustrated, indexed. Williams & Wilkins, Baltimore, Md. 1953. $8.

Two books have been added recently to those dealing with medical mycology. The first, by G. C. Ainsworth, is well deserving of its title which is MEDICAL MYCOLOGY, An Introduction to its Problems. The author reveals his knowledge and appreciation of the problems and discusses them in a very clear and understanding manner. He not only records the more recent advances made in the study of the fungi pathogenic to man but, in addition, refers to many little facts of historic interest, hitherto hidden in the early literature. The discussion of "madura" foot, a subject which is accorded little consideration in the usual text, is particularly helpful. The systemic infections and the problem of dimorphic fungi receive adequate attention, as do the subjects of immunity, allergy, and toxicity.

The illustrations are few but of good quality and well selected. The book is without doubt a real contribution to the field of medical mycology, helpful to the experienced mycologist, to the teacher, and to the young student.

The second book, on the other hand, is written for the beginner and scarcely deserves the title, ATLAS OF MEDICAL MYCOLOGY, since the mycology has been simplified to the extreme. Emphasis is laid on Littman's oxgall agar as the medium of choice. No one will deny the value of this medium in handling contaminated material, but for many fungi a more suitable isolation medium can be found. As for the study of the fungi and their definite identification, a variety of media is necessary.

The illustrations are many and of variable quality. The clinical pictures are good but the photomicrographs less so. A few, such as that of *Histoplasma capsulatum* in

tissue, are very characteristic. The book will no doubt be of some value for the clinician and for the inexperienced laboratory technician.

RHODA W. BENHAM
Dept. of Dermatology
College of Physicians & Surgeons

PLANT ANATOMY. Katherine Esau. 735 pages, illustrated, indexed. John Wiley, New York. 1953. $9.

Professor Esau has presented in this volume a wealth of information and a careful interpretation of the data. The treatment, according to the foreword, is colored by the author's special interests in development. It is fortunate that these interests have brought together so much scattered information relating to current studies. There is a remarkable synthesis of descriptive and historical data with the theme of development. A special value of the text lies in the emphasis on concepts. Terms are analyzed and their utility and limitations are evaluated. The concepts are illustrated with selected forms for which adequate information is available. Where functional and phylogenetic theories are applicable, they are discussed tersely, without advancing doctrines. Portions of the book are concerned with difficult and complex topics. The discussion of these topics is direct and avoids the too frequent error of attempting to "simplify" things which are not simple.

Excellent line drawings and diagrams illustrate the text and major references are cited frequently. Excellent photographic illustrations, unfortunately, are grouped in plates at the end of the book "for the sake of economy in printing."

Despite the obvious care in condensation, the text is a lengthy one. There may be rare courses in which the whole text could be used. It is likely that judicious selection could make the text useful in most courses, and the rest of the text would challenge the best students. For the botanist in any field, the book is an indispensible reference.

H. WESTON BLASER
University of Washington

TEXTBOOK OF WOOD TECHNOLOGY. Vol. II. H. P. Brown, A. J. Panchin, C. C. Forsaith. 783 pages, illustrations, index. McGraw-Hill, New York. 1952. $10.

Volume I of this two-volume work was an authoritative treatment of the structure, identification, defects, and uses of the commercial woods in the United States. This volume deals with the various properties of woods which must be considered in utilizing this very important national resource.

Although wood is among the oldest of structural materials, it is still one of the most useful and widely used. This modern industrial and mechanically-operated world not only uses tremendous quantities of wood in its peaceful pursuits, but also requires astonishing quantities in its military adventures. For example, wood is first in volume and second in tonnage of raw material needed for all types of naval military construction, afloat and ashore. With a multiplicity of uses and with significant variation in wood character between trees of the same species and between species, a comprehensive understanding of the properties of wood is essential to its proper and continued use.

This book, by three eminent wood technologists, assays to set forth the physical, chemical, and mechanical properties of wood so that technicians — foresters, engineers, architects, wood technologists — can project wood use into the atomic age in a sound and scientific manner. The book is highly technical and does not discuss the marvels of wood for the multitudes. Significant basic data have been conscientiously gleaned from a long list of reference material, and from the researches of the authors, and have been arranged to show relationships of character to properties. The book covers a wide range of material. Particularly well done is the portion on wood moisture relationships— a very important and plaguing technical area. Engineers dealing with all phases of timber mechanics will find the list of essential formulas and their derivations for calculating use characteristics to be complete.

Less technically minded, will find the concise resumés with good bibliography of the gluing and finishing of wood to be full of material and up-to-date. The general reader, especially should not miss part III, which deals with the chemistry of wood. This part, well written (as is all of the book), gives a very clear picture of the possibilities and problems of this imagination-gripping field. Here are discussed the use of wood for such things as rayon, plastics, and edible sugars; as well as lignin, that mysterious substance which makes up from one-sixth to one-third of "wood" and which, in spite of more than one hundred years of intensive research, is still unknown. Designed for a special audience and use, this book fulfills its purpose and will be found useful far beyond the authors' intent. It is a fine example of a modern textbook in a very broad technical field.

CHARLES R. LOCKARD, *Technologist*
Northeastern Forest Exp. Sta.
Forest Service, U.S.D.A.

FORESTRY AND ITS CAREER OPPORTUNITIES. Hardy L. Shirley. 492 pages, illustrated, indexed. The American Forestry Series. McGraw-Hill, New York. 1952. $6.50.

The dean of the New York State College of Forestry has succeeded admirably in his attempt to "present a broad picture" of the field of forestry. Nineteen of the twenty-six chapters are concerned with introducing the reader to modern forestry. Timber growing, logging, the manufacture of various wood products, the interrelationships of forests with soil, wildlife, and recreation, and the importance of forests to our national and world economies are described and discussed in these chapters. The remaining seven chapters are devoted to an objective analysis of the expanding profession of forestry and the opportunities this profession offers to young men.

While the first portion of the book comprises the most complete, accurate, and up-to-date description of the general field of forestry activities available, the following section is, perhaps, even a more unique contribution. The last seven chapters should be a "must" on the reading list of every career counselor and every high school or college student who feels he may be interested in a career in forestry.

While Dr. Shirley's book is written primarily as a text for college freshmen who intend to enter the forestry profession, laymen interested in forestry or conservation would find this well-written book offering them interesting and informative reading.

CARL H. STOLTENBERG
School of Forestry
Duke University

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NEWS, NOTES and COMMENTS

"Cotton From Fable to Fashion"

Exhibition continues 'til November 15 in the Museum Building.

Mystery shrouds the date when cotton was first employed for cloth: its use is older than history. "The Sacred Institutes of Manu" record its use about 800 B.C. In 450 B.C. Herodotus speaks of trees in India bearing "for their fruit fleeces surpassing those of sheep in beauty and excellence and the natives clothe themselves in cloths made therefrom. . ." Nearchus, an admiral of Alexander the Great, while leading an army along the southeastern shore of Asia described "trees in India bearing branches of wool. The natives make sheets, skirts and turbans of it. . ."

India was the leader in cotton for several thousand years. Even with primitive equipment, the natives wove muslin of exquisite texture; in fact, the fineness of this muslin was not matched by any other country until the latter part of the nineteenth century. There are accounts of muslin from Bengal so delicate that when it was laid on the grass, it was not distinguishable from the dew which covered it. From India cotton was imported to Persia at a very early date; its use in 519 B.C. is recorded in the first chapter of Esther. Cotton also found its way into China from India in early times; but reluctant to change their habits of dress, the Chinese continued to use the same fabrics for making clothes their ancestors had used. It was not until 1300 A.D. that the Chinese used cotton generally.

Written records of the use of cotton in Peru date back to 1500 A.D., but mummy wrappings and fabrics found in tombs indicate its use 2500 B.C. Pizarro, when he invaded Peru in 1522, found the natives clad in cotton garments, but as the Spaniards were seeking gold, they paid scant attention to cotton and its possibilities as an industry. Cotton was grown and used in Brazil untold years before that land was visited by Europeans at the begnning of the sixteenth century. Mexico, too, knew how to make cloth from cotton before that land was discovered by Europeans. Among the presents Cortez received from Montezuma were "curtains, coverlets and robes of cotton, fine as silk, of rich and various dyes, interwoven with feather work that rivalled the delicacy of painting. . ." Cortez in turn presented to Charles V mantles, waistcoats, handkerchiefs, tapestries, and carpets, all made of cotton.

The United States, by comparison, is young in the production and use of cotton. Introduced to the Colonies in the early years of the seventeenth century, its production was rigidly restrained in order not to interfere with the lucrative production of tobacco. As time passed, its importance as a source of income and profit was recognized. It was in the hands of U. S. planters and manufacturers that enormous strides were made in the culture and manufacture of cotton. Following Whitney's invention of the cotton gin in 1793, the American cotton industry forged ahead rapidly. Mills were built and power machines were developed for carding and spinning, but weaving continued to be done on hand looms and in the homes, especially in the South, for many years. Today, America's cotton fields lead the world in production of this valuable crop and our mills in the fabrication of dress goods, laces, carpets, draperies, and other materials.

All this from one small genus of the plant kingdom to which Pliny gave the name *Gossypium*, for what reason no one knows. *Gossypium* belongs to the same plant family as do the hollyhock and the mallow and is indigenous to Asian and American continents. It has about fifty species but relatively few of them are grown commercially. There are, however, many varieties profitably employed by cotton planters. In America Upland cotton varieties, Sea Island cotton, and Egyptian cotton varieties are grown.

New varieties are constantly being developed to meet the requirements of growth under different soil and climatic conditions and to tolerate the many diseases and insects which attack cotton plants. By repeated hybridization, other important characteristics are imparted to a variety. Most important of the characteristics are those affecting the fiber, such as length, strength, and color, uniformity of its growth and maturation, as well as production. Varieties are known with many colors of fiber: white, tan, rust, brown, and green. However, as white is the most desirable color for industry, only types producing white lint, in combination with other desirable characters, are grown commercially.

The lint, as it is called at maturity, is actually the fluffy cellular filaments or hairs which cover the numerous seeds contained within the triangular seed pods. The downy filaments are exposed when the pods or "bolls" burst open on ripening. Few crops present so beautiful an effect as does cotton, "especially at the gathering season when the globes of snowy wool are seen against the dark green leaves." In June, too, the cotton fields are beautiful when in flower. The flowers, resembling the flowers of the hollyhock, change color from day to day—from pale straw to white to faint pink, sometimes to a deeper pink.

Hollyhock, *Althaea rosea* (left), mallow, *Hibiscus Moscheutos* (right) and cotton, *Gossypium barbadense* (above) belong to the same plant family, Malvaceae

Club Membership. For an annual membership fee of $50, The New York Botanical Garden offers special privileges to garden clubs, garden units or departments of women's clubs and community clubs, horticultural societies, etc., within reasonable traveling distance of New York, and to their individual members.

PRIVILEGES OF CLUB MEMBERSHIP

A speaker for one meeting a year, selected from the Garden's scientific staff.

Club Membership Day at The New York Botanical Garden, to be held annually in April.

Meeting of an informal nature — round-table discussion — to be held annually in October.

Guided tour of the Garden.

Use of the Members' Room for meetings.

Subscription to The Garden Journal of The New York Botanical Garden.

The individual members of a club membership enjoy:

Reduced fees for study courses.

Opportunity to subscribe to The Garden Journal (in a group not less than 10) at the special subscription rate of $1.65 per year.

Admission to Members' Day programs and other special events for members.

Club Membership in The New York Botanical Garden aids the institution's program of display, research and education — a program which rewards those who support it through the benefits it conveys to all who enjoy fine gardens and appreciate the importance of plants to human life.

Further particulars about the advantages to be derived from Club Membership may be had by writing Dorothy E. Hansell, in charge of Club Membership, The New York Botanical Garden, Bronx Park, New York 58, N. Y.

Dates to Remember. Open House at Downtown Office of The New York Botanical Garden, 22 E. 60th St., New York 22, N. Y.: October 13, G. L. Wittrock in attendance; November 10, Dr. P. P. Pirone in attendance; December 8, Louis P. Politi in attendance.

Theatre Benefit. "Solid Gold Cadillac" at Belasco Theatre, November 10. Mrs. Richard S. Meredith, Mrs. Charles G. Stradella, co-chairmen. Tickets obtainable from Downtown Office of The New York Botanical Garden.

Eighth International Congress of Botany. The Congress will be held in Paris July 2-14, 1954. General and special excursions will take place before and after the Congress: June 15-20, North Africa, Languedoc, Alsace-Lorraine, Nord, Brittany, Normandy, Vendée, Guyenne, Landes, Basque country, and Paris area; July 15-22, Nice via Burgundy, Jura, the Alps, Provence, Massif Central and the Pyrenees. A Post-Confree will take place at Nice, July 22-25 or 26.

The subscription will probably be $15.00, with a reduced fee for students and persons accompanying members. Address correspondence to Secretary General, Eighth International Congress, 292 Rue Saint-Martin, Paris 3, France.

Garden Tour in Europe. Several members of The Garden were among the eighteen amateur and professional gardeners who recently returned from a seven weeks Spring Garden Tour under the personal leadership of Adrian Frylink of Babylon, Long Island. Leaving for Holland on the new Holland-America Liner "Maasdam" on April 16, the group visited the famous "Flora" and "Keukenhof" flower shows, the great horticultural centers of Sassenheim, Boskoop and Aalsmeer, and various parks and estates in other parts of the country.

The magnificent parks and greenhouses of the Royal Palace in Brussels were visited by special permission, while another full day was spent in the nurseries around Ghent and the renowned Sanders' orchid ranges.

Highlights of the ten-day stay in France were the famous Kahn gardens in Paris, the Royal Parks and the National Horticultural College in Versailles, and the ancient chateaux of the Loire Valley with their great parks.

In England the Royal Botanical Gardens in Kew, the trial grounds of the Royal Horticultural Society in Wisley, and a preview of the Chelsea Show were much appreciated. From London the tour went via Stratford on Avon, Bristol, Torquay, and Bournemouth to Southampton, visiting many beautiful and interesting estates en route.

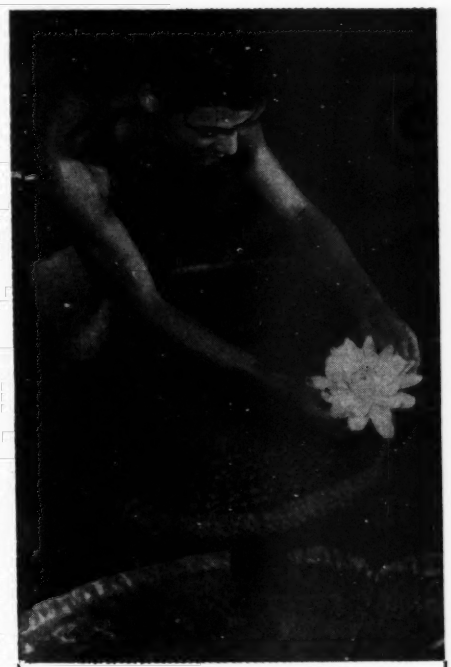
The unique feature of the tour were the many official receptions, luncheons, and dinners tendered by various mayors and municipal authorities and horticultural societies, never offered to the average tourist, which gave the members an opportunity to exchange ideas and meet new friends.

Mr. Frylink is planning a similar trip for the spring of 1954.

Studies on Plant Utilization of Dew. A discovery at the Earhart Plant Research Laboratory of the California Institute of Technology offers new hope for the cultivation of food plants in the dry and semi-arid zones of the earth. Every gardener knows that plants absorb moisture from the soil through their roots and evaporate it from their leaves; but when a plant has wilted for lack of soil moisture, this process may be reversed. Dew forming on the leaves is absorbed, fills the stem and the roots, and is even excreted by the roots into the surrounding soil to be held in reserve there until the plant needs it.

This method of absorbing and using water from the cool night air and from the occasional mists that are not uncommon in dry areas was observed in a research, sponsored and partly financed by UNESCO, under the direction of the Netherlands-born plant physiologist, Prof. F. W. Went, Director of the Laboratory. He was assisted by M. S. Duvdevani, a citizen of Israel. The work was reported at the meeting of UNESCO's Advisory Committee on Arid Zone Research, held in Paris in May 1953.

These studies indicate that dew is a major resource of many dry areas and that the choice of food plants that are able to utilize dew may lead to an increase of arid-zone vegetation and food production.



"Dear Dr. Robbins: We are very happy to say that the *Victoria regia* which you kindly sent to us has been pleasing the millions of citizens by bearing its wonderful flowers every year. All the other seeds you sent to us also have successfully sprouted and produced pretty flowers."

(Signed)
Koichi Mizuno, Director
Higashiyama Botanical Garden
Nagoya City, Japan

Mr. Ohara, manager of the Nagoya Factory, Toyo Plywood Manufacturing Co., Ltd., visited The New York Botanical Garden this summer and brought the above message from his friend, Koichi Mizuno.

Roses Donated by the U.N. Two thousand roses have been donated by All-America Rose Selections to the U.N. Headquarters for a rose garden on the eastern end of 45th Street, New York City, between Assembly Hall and Franklin D. Roosevelt Drive. Prize-winning varieties included in the gift are:

Hybrid teas: Rubaiyat, Dickson's Red, Charlotte Armstrong, Mirandy, Peace, Grande Duchese Charlotte, Mission Bells, Horace McFarland, Helen Traubel, Lowell Thomas, Chrysler Imperial, San Fernando, Forty-Niner, Capistrano, Mary Margaret McBride, K. T. Marshall, Mojave, Sutter's Gold, Diamond Jubilee and Fred Howard.

Floribunds are: World's Fair, Vogue, Fashion, Ma Perkins and Lilibet.

Tree Roses are: Peace, Vogue and Charlotte Armstrong.

Autumn Exhibition, Horticultural Society of New York. The autumn exhibition of the Horticultural Society of New York, Inc., for the benefit of the Good Will Industries of New York, Inc., serving handicapped people of all ages, races and creeds, will be held in the Collonades Ballroom, Essex House, November 5-7. Interpretive decorative flower compositions will be created by the area's top flower artists under the titles, "This is New York (the Metropolitan Opera House)"; "Fruits of our Labor"; and "Chrysanthemums." Plants and flowers from private conservatories and commercial establishments will be exhibited in sixty classes.

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from the HERB SHELF

"If ye have faith as a grain of mustard seed, ye shall say unto the mountains, Remove hence to yonder place. . ." Matthew 17:20.

In their monumental work, PLANTS OF THE BIBLE, H. N. and A. L. Moldenke explore the arguments for and against the possibility that the mustard of the Bible is what we know as *Brassica nigra,* black mustard. The ground seeds of this species form the mustard of trade.

The authors conclude that the mustard which "becometh greater than all the herbs, and becometh a tree, so that birds of the air come and lodge in the branches thereof," could have been *Brassica nigra* because travelers in Biblical lands today have reported plants of mustard which have escaped from cultivation and are growing along the roadsides.

These wildlings often measure ten to fifteen feet in height with a main stem as thick as a man's arm. Although they are only annual herbs, the stems and branches become stiff enough in the autumn to bear the weight of perching birds. The birds are attracted by the seeds, which are a favorite food.

The black and the white mustard, *Sinapis alba,* were grown in Biblical times for the seeds which yield a useful oil as well as being a condiment. Just as the use of mustard has not changed in nearly two thousand years, neither has the significance of the seed. The latest thing in jewelry today is a gold-rimmed sphere of clear plastic encasing one grain of mustard seed to be worn as a reminder of faith.

HERB MUSTARDS

Mustard making is one of the pleasantest tasks of early fall, when the extra harvest of herbs is too fair to leave for frosts. Decorative pots of this spicy sauce sell fast at church bazaars, even though the purchaser may not know their connection with the Bible.

Mix eight tablespoons dry mustard with eight tablespoons of flour and add four teaspoons salt and nine teaspoons sugar. Add enough vinegar to bring to proper consistency. Divide in four parts. Add one tablespoon horseradish to the first part; one tablespoon finely chopped tarragon and parsley to another; one tablespoon sage and marjoram to the third; and a tablespoon of rosemary or thyme with just a dash of lovage in the fourth. Put each quarter in a small pot, label, and store.

This recipe is taken from the book, COOKING WITH AN ACCENT, by Isabella Gaylord.

GERTRUDE B. FOSTER

"TOWARD HARDINESS IN AZALEAS"

Mr. Skinner's article on azalea hardiness in the March-April 1953 issue of "The Garden Journal" prompts me to relate some of my experiences with these plants.

My original planting was made following the usual recommendations for these plants — that they would take full sun, etc. Practically one hundred percent loss followed. Discarding these published recommendations, which may be perfectly satisfactory in eastern areas, and making allowances for our entirely different ecology, I have proved that azaleas of many species and varieties are perfectly satisfactory here. I now plant all azaleas on the north side of my home or in a lath house, the roof being made of 1" x 4" lumber, spaced one inch apart, giving about seventy percent shading; this shading is about seven feet above the soil level. The rooting medium is a mixture of sand and rotten saw dust, usually one-quarter sand and three-quarters saw dust.

The limiting factors in growing azaleas here are two-fold. Some years we get a variation of from 10° below zero to 108° temperature. This factor is not, in my opinion, any more important than our low humidity and our sun. In the east the sun, both winter and summer, is tempered by clouds, fog, and smoke. Here our winter and summer suns are frequently very intense; and our winter humidity frequently drops below twenty percent and our summer below forty percent. Under this sun and low humidity, further complicated by frequent high winds, plants have small chance to survive, unless protection from both sun and wind is provided. The report below is based on azaleas planted as described.

For this area, the Kaempferi hybrids have taken our conditions very well. The species *Kaempferi* has not done quite so well and is not so satisfactory. I have tried out about twenty different Gable hybrids and all but two or three have been very satisfactory. I think Gable's "Rosebud," "Rose Greeley," "Boudoir," "Caroline Gable," and "Elizabeth Gable" among the very desirable azaleas. To date they have been one hundred percent hardy, most of them having endured the temperature extremes above.

"Vuykiana Wilhemina" has taken zero with no damage and I like it. "Mossieanum" is hardy but not a good enough bloomer. I have a number of Ghent hybrids and they have proved very very satisfactory. "Raphael de Smet," "Coccinea Speciosa," "Gloria Mundi," "Bouquet de Flora," "Narcissiflora," and "Daviesii" have been very very good, perfectly hardy, but all are on their own roots. Grafted azaleas here are *not worth having,* since any but ideal conditions almost invariably kill them. The purchase of grafted azaleas for this area is, in my opinion, a waste of time and money.

We have a number of *R. molle.* It is temperamental; if conditions are not exactly to its liking, it sulks and its bloom lacks the beauty of *japonicum.* I believe Mr. Skinner hardly did this species justice. It is, in many ways, the ideal deciduous azalea. It will take more sun, cold, heat, drought, and excessive moisture than any species I have tried and its winter appearance is better than that of most deciduous varieties. *Poukhanensis,* if its bloom equalled those of *japonicum,* would rank with that species, and next to *japonicum* is the best of the species azaleas for this area. *Schlippenbachii* has to date been too temperamental and for some reason, probably summer heat, *calendulacea* has not been satisfactory.

Azaleas are easy to grow in this area, provided soil conditions are made up approximately as stated above, and provided the grower will remember that planting instructions, given usually for eastern conditions, cannot be followed in this section. Most of the Gable hybrids, *japonicum, pukhanensis,* and the Kaempferi hybrids will give a satisfactory account of themselves and at least some of the Ghents if own rooted — no grafts. None of the Kurumes will survive in this area, though one hundred fifty miles south they do well.

I now have a number of the Knap Hills, own rooted, which will be ready for trial outside next fall. I am also trying out about two hundred Glenn Dale hybrids. Several are proving perfectly hardy at zero, and all take summer sun better than most of the others.

Just one comment — fall planting is highly inadvisable here; and unless the grower has had previous experience in growing azaleas, two-year or preferably three-year-old plants should be purchased.

HARRY V. SEEVERS
Ottawa, Kansas

"Azaleas have been one of my pets for many years, and I am much interested in Dr. Skinner's article. The question of hardiness you always have with you — whether it is the unusual year that comes in once in ten or twenty years, or the abnormal fall that brings an early and severe frost after a warm and wet spell. Here on Chesapeake Bay — and my plantings are right on the shore on cliffs about fifty feet above the water — I have less problems with varieties that give trouble inland."

H. E. ALLANSON
Port Republic, Md.

"Dr. Skinner's article was written with much thought and known facts. It should be a guidance to those who are in doubt about the hardiness of azaleas — there are no loose or wild statements or claims. Dr. Skinner offers much encouragement towards what can be done with azaleas where severe winters prevail and presents a bright outlook for hardier azaleas in the making. His broad knowledge and experience with azaleas has enabled him to word each paragraph in a manner most interesting — 'Toward Hardiness in Azaleas' will be filed among my valued data."

H. J. HOHMAN
Kingsville, Md.

"The article by Dr. Skinner is of great value to every one interested in azaleas.

"I am trying for greater hardiness in our own region here in the western valley of Oregon. We have a very fickle winter climate here, 11° below zero in 1949-50 and so far this year not lower than 23° above.

"I hope Dr. Skinner will have something to say about sun hardiness. I have lost more plants because of lack of sun-resistance than because of lack of cold-resistance. A good many people would like to be able to grow plants in spots other than under trees in partial shade."

E. J. KRAUS
Corvallis, Oregon

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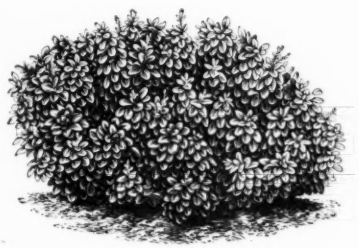

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No other firm in the country can match Wayside's remarkable collection of superior, hardy, ***"root-strength"*** plants for fall planting. Of special merit are the following handsome, new introductions: a golden Anthemis —3 spicy, new Dianthus and 9 "Brilliantly Colored Asters."

BLEEDING HEART. *Bountiful.* Finest "Bleeding Heart" to date. It blooms much longer and has flowers twice as large as Dicentra, *Eximia.* Produces 30 to 40 brilliant, fuchsia-red flower stalks every spring and fall.

New BULBS

TULIPS

Wayside's ***"Tulips of the Future"*** in a glorious range of colors and types are the largest, top-quality, imported tulips offered anywhere. Many of these brand new, superior varieties will be obtainable only from Wayside for years to come.

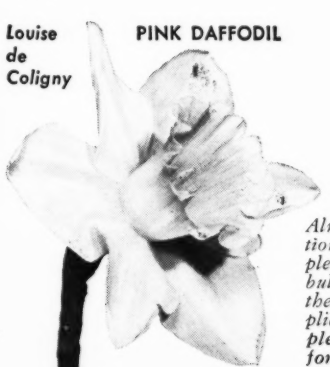
DAFFODILS

WEATHER-PROOF DAFFODILS. The amazing stamina and breathtaking beauty of these entirely new daffodils will be a revelation to you. They bloom gaily unafraid of wind, rain or burning sun. Multiply rapidly —Six bulbs will produce over 30 stunning flowers the second year. ***"Duke of Windsor"*** is outstanding, with white-petalled flowers fully 6" across.

PINK DAFFODILS. See ***Louise de Coligny,*** newest and most fragrant of Wayside's flawless new pink daffodils. A real investment in beauty—4 bulbs produce 20 enchanting flowers the 2nd year. Hardy and easy to grow.

HARDY LILIES

MID-CENTURY HYBRIDS. You can't fail with these absolutely hardy, foolproof, new lilies that grow and multiply freely in any garden. Catalog offers a superb mixture in vibrant colors ranging from chrome-yellow, orange, gold to fiery red. Gorgeous flowers have a glowing radiance seldom seen in lilies.



Louise de Coligny PINK DAFFODIL

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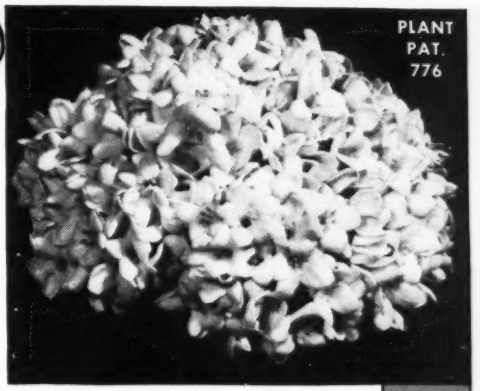
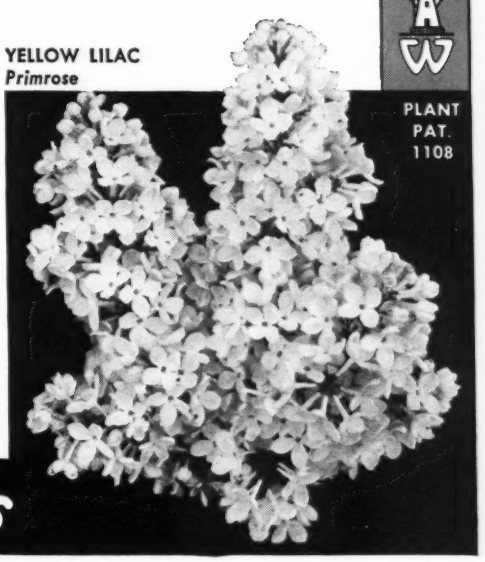


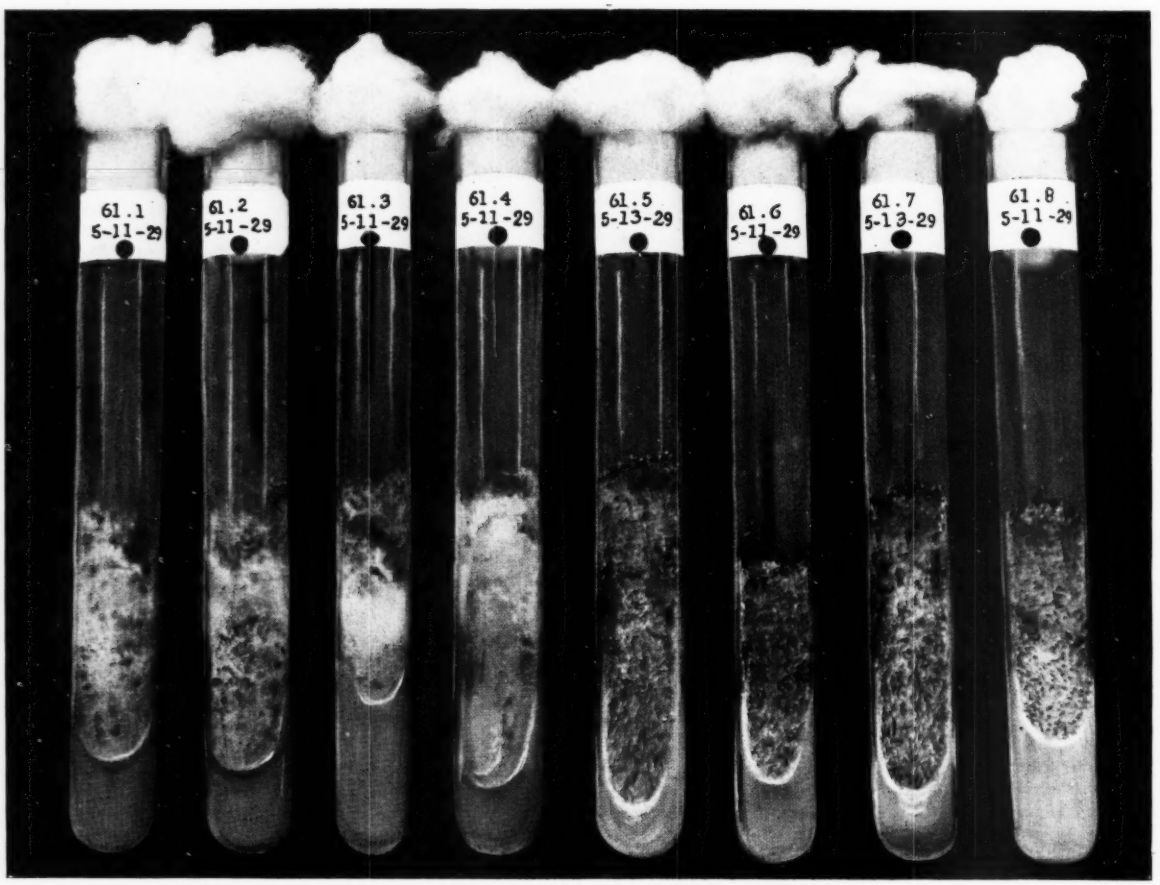
VIBURNUM, *Carlcephalum*
FRAGRANT SNOWBALL

WEATHER PROOF DAFFODIL
"Duke of Windsor"

BLEEDING HEART, *Bountiful*

YELLOW LILAC
Primrose





DR. DODGE'S NEUROSPORA

Cultures from the eight spores of one ascus, arranged in order. White growth, albinistic; orange, conidial. Red spots indicate one mating-type, and green the other